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COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

CLEAN 3

FINAL
SITE-SPECIFIC SAFETY AND HEALTH PLAN SUPPLEMENT
OPERATION AND MAINTENANCE PLAN
OPERABLE UNIT 3
MARINE CORPS AIR STATION TUSTIN
ORANGE COUNTY, CALIFORNIA

CTO-0045/0030-1
June 2003

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ACRONYMS/ABBREVIATIONS

AQO	air quality objective
ARAR	applicable or relevant and appropriate requirement
ASTM	American Society for Testing and Materials
BEI	Bechtel Environmental, Inc.
bgs	below ground surface
BNI	Bechtel National, Inc.
°C	degrees Celsius
CCR	*California Code of Regulations*
CEG	(California) Certified Engineering Geologist
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CIWMB	California Integrated Waste Management Board
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	(U.S. EPA) Contract Laboratory Program
COC	chemical of concern
COPC	chemical of potential concern
CTO	contract task order
DCA	dichloroethane
DCB	dichlorobenzene
DCE	dichloroethene
DMP	data management plan
DON	Department of the Navy
DQO	data quality objective
DTSC	(California Environmental Protection Agency) Department of Toxic Substances Control
ERO	Emergency Response Officer
ERP	emergency response plan
FSP	field sampling plan
HCl	hydrochloric acid
HDPE	high-density polyethylene
IDWMP	investigation-derived waste management plan
IRP	Installation Restoration Program
JP-5	jet propellant grade 5

LFG	landfill gas
LTM	long-term monitoring
LTMP	long-term monitoring plan
LUCICP	land-use control implementation and certification plan
MCAS	Marine Corps Air Station
MCL	maximum contaminant level
mL	milliliter
OCHCA-EH	Orange County Health Care Agency--Environmental Health
OMP	operation and maintenance plan
OU	operable unit
OVA	organic vapor analyzer
PCB	polychlorinated biphenyl
ppb_v	parts per billion by volume
ppm	parts per million
ppm_v	parts per million by volume
QAPP	quality assurance project plan
RAO	remedial action objective
RAP	remedial action plan
RI	remedial investigation
ROD	record of decision
RWQCB	(California) Regional Water Quality Control Board
SDWA	Safe Drinking Water Act
SSHP	site-specific safety and health plan supplement
STD	standard deviation
SWDIV	Southwest Division Naval Facilities Engineering Command
TAL	target analyte list
TCE	trichloroethene
TDS	total dissolved solids
TPH	total petroleum hydrocarbons
U.S. EPA	United States Environmental Protection Agency
VOA	volatile organic analyte
VOC	volatile organic compound
WBZ	water-bearing zone

Section 1
INTRODUCTION

Bechtel Environmental, Inc. (BEI), prepared this final Operation and Maintenance Plan (OMP) within the context of the U.S. Department of the Navy (DON) Installation Restoration Program (IRP) for Operable Unit (OU)-3, Marine Corps Air Station (MCAS) Tustin, California. BEI prepared this OMP in accordance with Contract Task Order 0045, issued under the Comprehensive Long-Term Environmental Action Navy 3 Program, Contract No. N68711-95-D-7526.

OU-3 was formerly known as IRP Site 1, the Moffett Trenches and Crash Crew Burn Pits site. The selection of the final site-specific remedy for OU-3, containment with institutional controls and long-term monitoring (LTM), and required elements of this OMP are presented in the final Record of Decision (ROD)/Remedial Action Plan (RAP) for OU-3 (SWDIV 2001). This OMP satisfies the California Environmental Protection Agency Department of Toxic Substances Control (DTSC) requirements for hazardous substance release sites pursuant to Title 22 *California Code of Regulations* (CCR), Chapter 50, Article 1.

This OMP presents inspection and maintenance, LTM, and contingency plans, including frequency of monitoring and reporting requirements to be used in support of the final remedy selected for OU-3, with the goal of protecting human health and the environment. Detailed descriptions of requirements for conducting fieldwork and data management activities are presented as attachments to this OMP. These attachments include a Field Sampling Plan (FSP) (Attachment A), a Quality Assurance Project Plan (QAPP) (Attachment B), a Data Management Plan (DMP) (Attachment C), an Investigation-Derived Waste Management Plan (IDWMP) (Attachment D), a Site-Specific Safety and Health Plan Supplement (SSHP) (Attachment E), and a Land-Use Control Implementation and Certification Plan (LUCICP) (Attachment F).

Documents considered to be integral components of this OMP include the Remedial Implementation Plan (BEI 2003) and the LUCICP for OU-3. The Remedial Implementation Plan presents an overview of this OMP, including inspection and maintenance activities and LTM requirements, and is intended to inform the public about the overall LTM program at OU-3. The LUCICP describes land-use controls, including institutional controls and legal mechanisms for their enforcement, and provides a listing of regulatory agencies responsible for assuring the continued implementation and effectiveness of the remedy during the LTM program.

1.1 REMEDIAL ACTION OBJECTIVES

The remedial action objectives (RAOs) for this project are to:

- control or eliminate the discharge of contaminated groundwater into Peters Canyon Channel that potentially impacts human health or the environment, and preserve existing high-quality surface water;
- prevent or minimize downward migration of contamination into deeper groundwater zones to preserve existing high-quality groundwater;
- prevent or minimize exposure to on-site groundwater, buried wastes, and subsurface soils that have contamination above health-based levels; and

- implement appropriate remedial actions as necessary to facilitate rapid transfer and reuse of the OU-3 property.

Results from inspection and maintenance and LTM activities described in this OMP will be used by the DON to demonstrate to the United States Environmental Protection Agency (U.S. EPA) that the approved remedial design has been completed and the remedy is "operating properly and successfully" in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 120(h)(3) (U.S. EPA 1996), prior to the OU-3 property being transferred. These results will include inspections of the presence and efficacy of the institutional and engineering controls implemented at the site; as well as evaluations of contaminant levels and distributions in groundwater and surface water. After U.S. EPA deems that the remedy is "operating properly and successfully," the DON may transfer the property.

1.2 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The overall goal of the RAOs for OU-3 is to control or eliminate off-site contaminant migration and prevent or minimize exposure to contaminated media. Implementation of this OMP is intended to protect human health and the environment by assuring the continued isolation of contaminated media at the site until site-specific action levels for groundwater and surface water at the site are achieved.

Currently, there are no exposure pathways to contaminated media at the site. A potential future threat to human health is inadvertent exposure to subsurface wastes or contaminated groundwater at the site. Successful implementation of institutional controls described in the LUCICP, however, will prevent inadvertent exposure to subsurface waste or contaminated groundwater by prohibiting future changes in land use, providing for inspection and maintenance of the containment wall, prohibiting on-site activities that could affect the integrity of the containment wall, and restricting subsurface exploration activities, including well installation, groundwater extraction, or inadvertent use of groundwater without prior DON and/or agency approval.

The final remedy selected for OU-3, as described in the ROD/RAP, meets the threshold criteria of overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs), and it provides the best balance of long-term effectiveness and permanence; short-term effectiveness; reduction of toxicity, mobility, or volume; implementability; and cost.

1.3 REGULATORY REQUIREMENTS

In addition to the DON, four regulatory agencies have oversight authority for inspection and maintenance and LTM activities to be performed in support of the final selected remedy for OU-3 during the LTM program. These agencies include DTSC, the California Regional Water Quality Control Board (RWQCB) Santa Ana Region, the California Integrated Waste Management Board (CIWMB), and the Orange County Health Care Agency – Environmental Health (OCHCA-EH). In addition, U.S. EPA will receive all appropriate documents that pertain to U.S. EPA's determination of whether the remedy is operating properly and successfully.

Approval of this OMP, including any modifications to the remedy (i.e., future reductions in or termination of inspection and maintenance activities or monitoring requirements) is required by DTSC, RWQCB, and the DON. Contact information for regulatory agencies is listed in Table 1-1.

The final remedy selected for OU-3 must comply with ARARs established under federal and state environmental laws unless a statutory waiver is justified. Section 121(e) of CERCLA, 42 *United States Code* Section 9621(e), states that no federal, state, or local permit is required for remedial actions conducted entirely on-site. Any action that takes place off-site is subject to the full requirements of the federal, state, and local regulations. The chemical-, location-, and action-specific ARARs for the final remedy selected for OU-3 are presented in detail in the ROD/RAP (SWDIV 2001). Only those regulatory requirements relating to the specific LTM tasks are provided in the applicable sections of this OMP.

1.4 DATA QUALITY OBJECTIVES

The data quality objectives (DQOs) established for the final remedy at the site followed the seven-step U.S. EPA DQO process (U.S. EPA 2000). The rationale for the DQOs is presented in Section 4 of the FSP (Attachment A). Section 3 of the QAPP defines the quantitative DQOs (Attachment B). DQOs were previously developed for existing groundwater and landfill gas (LFG) monitoring programs. To meet the RAOs for this LTM program, OU-3 site DQOs for groundwater and surface water were modified as appropriate from existing DQOs developed for the OU-3 site as a part of the MCAS Tustin basewide groundwater monitoring plan (BNI 1997). To meet the RAOs for this LTM program, DQOs for LFG were modified as appropriate from the Annual Summary Report for Monthly Landfill Gas Monitoring January through December 2000 for OU-3 (BNI 2001a). The DON currently has an exemption from LFG monitoring at OU-3 from the CIWMB; however, DQOs for LFG were included in this OMP for completeness in the event LFG monitoring is required in the future. The data collected during the LTM program will be used to assess potential risks to human health and the environment, if any. The DQOs developed for the LTM program consist of qualitative and quantitative statements describing the required detection limit, degree of certainty, and laboratory quality control level for each specified use.

1.5 REPORT ORGANIZATION

Section 2 presents an overview of the site location, background, geology, hydrogeology, and the nature and extent of contamination present at OU-3. Section 3 presents the inspection and maintenance plan for institutional and engineering controls implemented at the site, including frequency of inspection and maintenance activities, and reporting requirements. Section 4 presents the Long-Term Monitoring Plan (LTMP) for groundwater,

Table 1-1
Regulatory Agencies Associated With
MCAS Tustin OU-3

Agency	Full Name	Address	Contact Person
DTSC	California Environmental Protection Agency, Department of Toxic Substances Control	DTSC Office of Military Facilities 5796 Corporate Avenue, Cypress, CA 90630	Jennifer Rich (714) 484-5415 Anantaramam Peddada (714) 484-5418
RWQCB	Regional Water Quality Control Board, Santa Ana Region	RWQCB California Tower 3737 Main Street, Suite 500 Riverside, CA 92501-3339	Patricia Hannon (909) 782-4498
CIWMB	California Integrated Waste Management Board	CIWMB 8800 Cal Center Drive Sacramento, CA 95826-3200	Michael Wochnick (916) 225-1302
OCHCA-EH	Orange County Health Care Agency–Environmental Health	OCHCA-EH 2009 E. Edinger Santa Ana, CA 92705-4710	Patricia Henshaw (714) 667-2014
U.S. EPA	United States Environmental Protection Agency	U.S. EPA 75 Hawthorne Street (SFD-H-8) San Francisco, CA 94105-3901	James Ricks (415) 744-3023

Acronyms/Abbreviations:
CIWMB – California Integrated Waste Management Board
DTSC – (California Environmental Protection Agency) Department of Toxic Substances Control
MCAS – Marine Corps Air Station
OCHCA-EH – Orange County Health Care Agency–Environmental Health
OU – operable unit
RWQCB – (California) Regional Water Quality Control Board (Santa Ana Region)
U.S. EPA – United States Environmental Protection Agency

LFG (if required), and surface water, including the frequency of monitoring, data evaluation, and reporting requirements. Section 5 presents the Contingency Plan. Where appropriate, citations to sections within the CCRs indicate the regulatory basis for a particular statement of activity. References cited in this OMP are listed in Section 6. This OMP is intended to be used in conjunction with the FSP (Attachment A), QAPP (Attachment B), DMP (Attachment C), IDWMP (Attachment D), and SSHP (Attachment E). Attachment F contains a copy of the LUCICP.

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Section 2
ENVIRONMENTAL SETTING

The information presented in this section briefly describes the site including the location, history, geology, hydrogeology, surface water, and the nature and extent of contamination. More detailed discussions on the history of site investigations, remedial actions, and enforcement activities relating to site contamination are presented in the ROD/RAP (SWDIV 2001).

2.1 SITE LOCATION

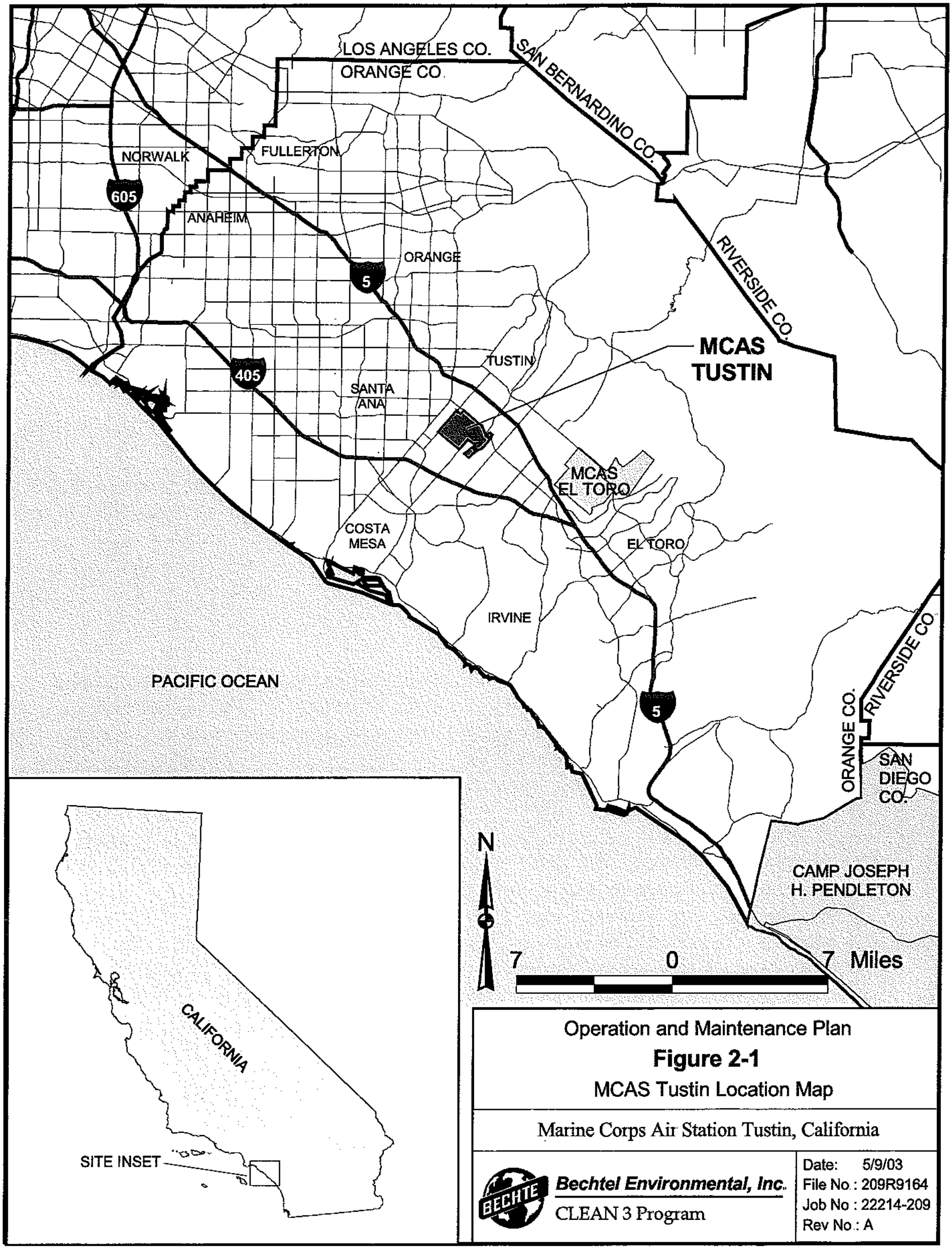
OU-3 is located within the MCAS Tustin property in Orange County, California, approximately 40 miles south of downtown Los Angeles and more than 100 miles north of the California/Mexico border (Figure 2-1). During the past 20 years, the area to the east of the site has changed from agricultural use to compact residential and industrial/manufacturing use while the area to the west has recently changed from agricultural to no use.

The Jamboree Road extension traverses OU-3 from the southwest and northeast, covering most of the site. The site is situated along the northwestern bank of Peters Canyon Channel. The site is bounded to the east by Peters Canyon Channel, to the northeast by Edinger Avenue, to the south by Moffett Drive, and to the west by former agricultural land (Figure 2-2).

2.2 SITE HISTORY AND DESCRIPTION

OU-3 consists of former unlined, shallow landfill trenches and pits constructed to burn flammable liquids for firefighter training exercises (Figure 2-3). The landfill trenches, which reportedly contain approximately 5,000 cubic yards of material, were used from the late 1940s or early 1950s until about 1971. The trenches are suspected of containing a mixture of MCAS Tustin-generated municipal solid waste and industrial waste, the latter reportedly including paints, oils, solvents, and transformers that may contain polychlorinated biphenyls (PCBs) (although no PCBs were reported during field sampling investigations conducted at the site). According to boring logs and trench logs, landfill materials consist of concrete, gravel, wood, glass, cobbles, metal, asphalt, and minor trash. The Crash Crew Burn Pits were used to burn flammable liquids for fire-fighting training exercises from about 1971 until 1983. Flammable liquids burned in the Crash Crew Burn Pits consisted primarily of jet propellant grade 5 (JP-5), as well as oils, solvents, lacquers, primers, and various chemicals. An estimated 250,000 to 350,000 gallons of liquid wastes was used for fire-fighting training at the burn pits. Further details regarding the site history are provided in the final ROD/RAP (SWDIV 2001).

The exact number and size of the trenches and pits are unknown because some newer trenches and pits were constructed over older sections. The area encompassing the landfill trenches and burn pits has been estimated as approximately 600 by 250 feet based on aerial photographs and historical information. Other subsurface features at the site include a "fishbone-style" French drain system and two sumps that were installed in 1987.



Operation and Maintenance Plan

Figure 2-1

MCAS Tustin Location Map

Marine Corps Air Station Tustin, California

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Job No: 22214-209
Rev No.: A

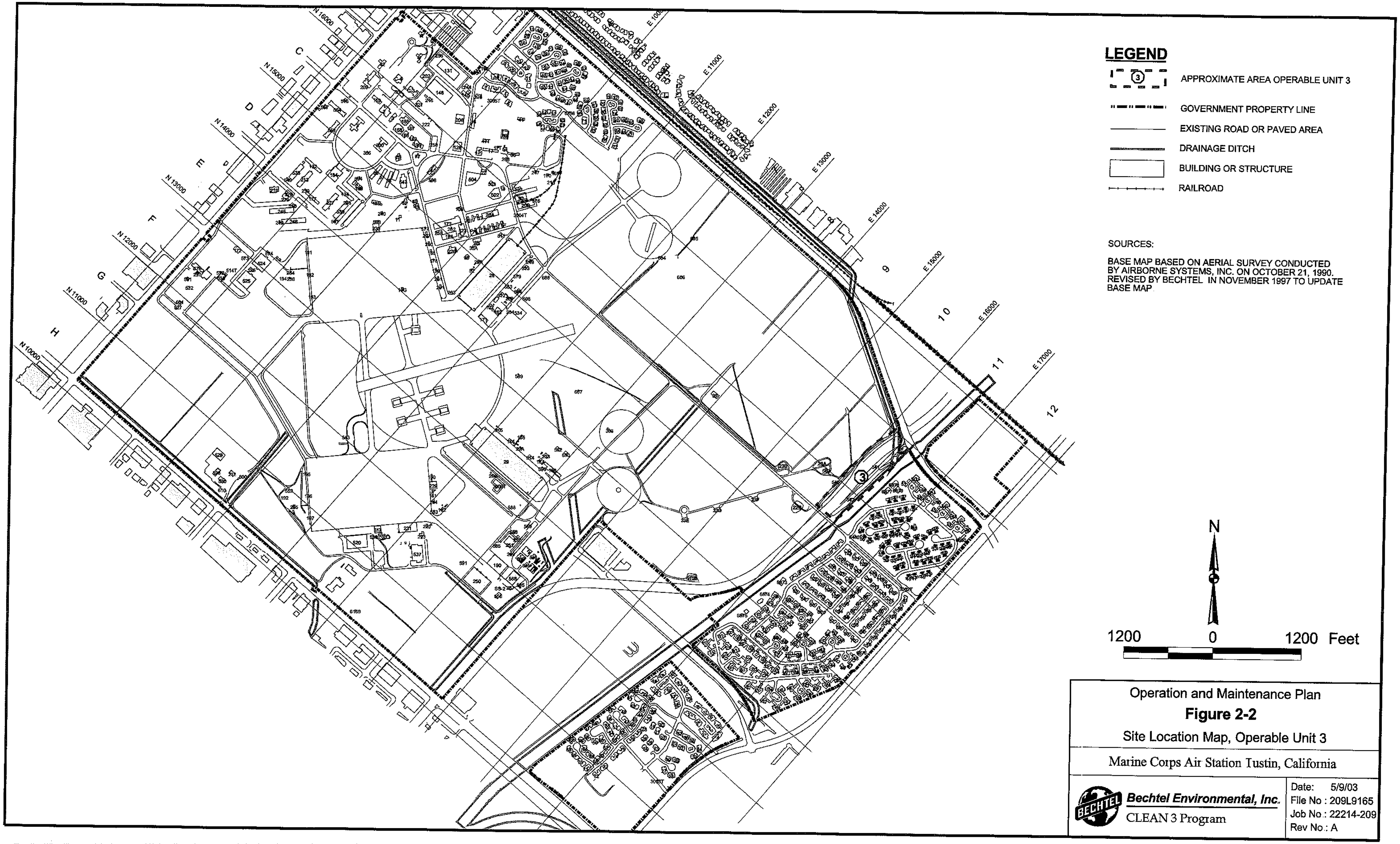

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Figure 2-2

Site Location Map, Operable Unit 3

Marine Corps Air Station Tustin, California

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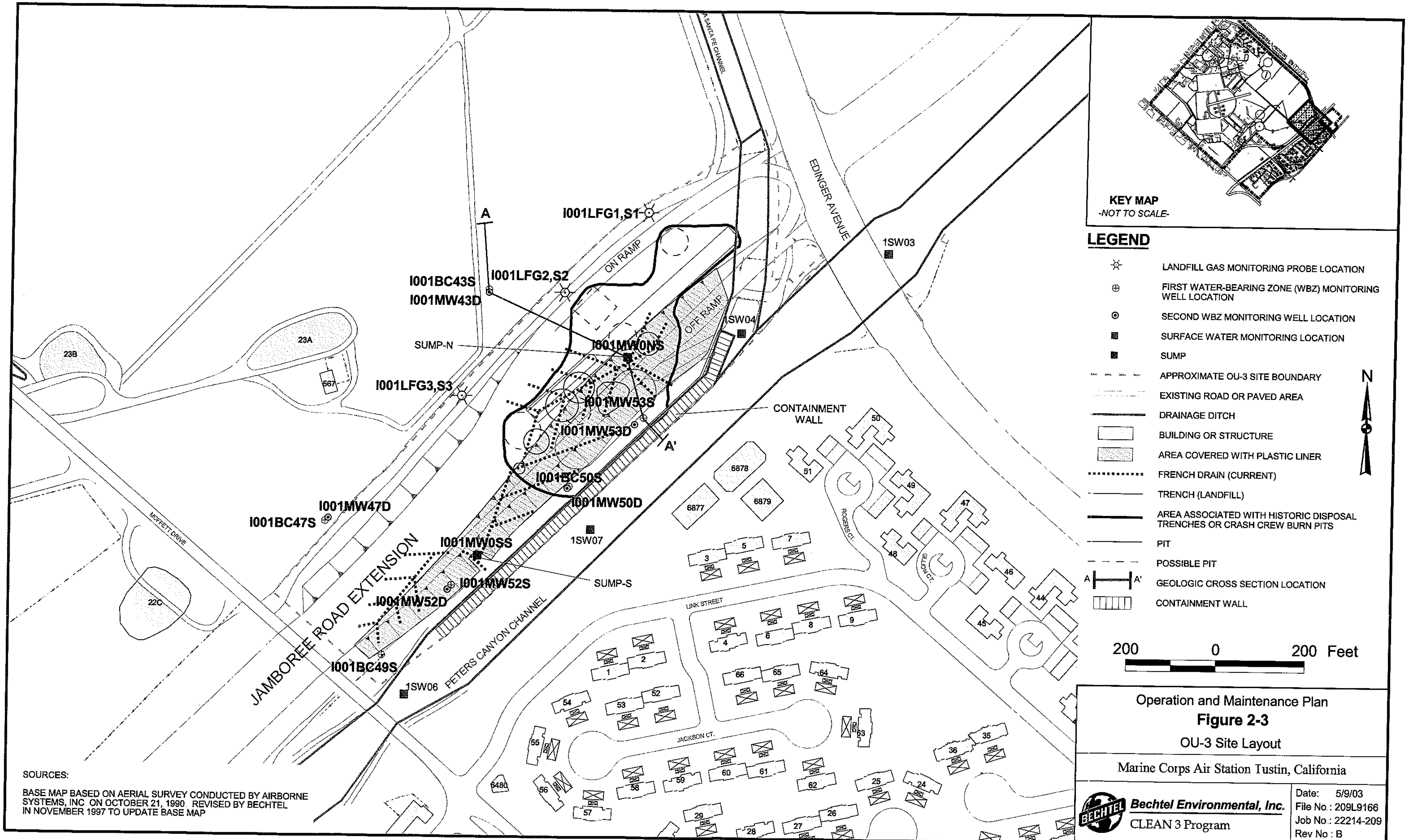
Job No : 22214-209
Rev No : A



SOURCES:

BASE MAP BASED ON AERIAL SURVEY CONDUCTED BY AIRBORNE SYSTEMS, INC ON OCTOBER 21, 1990. REVISED BY BECHTEL IN NOVEMBER 1997 TO UPDATE BASE MAP

Operation and Maintenance Plan

Figure 2-3

OU-3 Site Layout

Marine Corps Air Station Tustin, California

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Job No.: 22214-209
Rev No: B

Subsequent to the remedial investigation (RI) conducted at OU-3, extensive road construction activities took place from 1997 to 1999. The site is mostly covered by the Jamboree Road extension, associated embankment slopes, and a southbound on-ramp and northbound off-ramp. Approximately 20 feet of fill material was placed on the site to support elevating and widening of Jamboree Road and construction of elevated ramps. A high-density polyethylene (HDPE) liner was installed on top of the original ground surface in the area below the fill and beneath the road improvements, immediately east of Jamboree Road. The road improvements also include a surface-water runoff collection system that directs surface water into Peters Canyon Channel. Additional information on the road improvements and HDPE liner are provided in Appendix B of the final ROD/RAP (SWDIV 2001).

A dirt access road, approximately 15 feet wide, is parallel and adjacent to the western bank of Peters Canyon Channel. This road is separated from the remainder of the site by a chain-link fence. The part of the site that has not been covered by the Jamboree Road improvements is a narrow strip between the east Jamboree Road embankment and the fence line and a narrow strip to the west that serves as an access road to the site. A steel-reinforced concrete containment wall, approximately 805 feet long, lines the western bank of Peters Canyon Channel adjacent to the site. A previously occupied residential area is located southeast of Peters Canyon Channel approximately 300 feet from the site.

2.3 GEOLOGY, HYDROGEOLOGY, AND SURFACE WATER

The upper 25 feet of native soils at the site consists predominantly of fine-grained material (primarily silts and clays of various plasticity). Pockets of coarser-grained material (silty sands and sand) were encountered close to Peters Canyon Channel in the northern and central parts of OU-3; these pockets terminate to the west and south. Presently, much of the coarser-grained material (silty sand or sand) encountered within the upper 20 feet is artificial fill and landfill material. Most of the sandy pockets are above the current water table.

The water table beneath the site was located at approximately 10 to 15 feet below ground surface (bgs) before construction of the Jamboree Road extension. Up to 20 feet of soil was added as fill to support road construction at the site. The shallow aquifer system beneath the site consists of an uppermost, unconfined water-bearing zone (WBZ) and two underlying semiconfined WBZs, referred to as the first, second, and third WBZs, respectively. The first WBZ extends from the water table to approximately 20 to 25 feet below the original ground surface and is separated from the second WBZ by a locally continuous clay aquitard. The second and third WBZs occur from approximately 30 to 60 and 60 to 90 feet, respectively, below the original ground surface. The boundaries between the WBZs vary from location to location, reflecting the heterogeneity of the sediments within each depth range. A "regional aquifer" beneath the site is present approximately 90 to 95 feet below the original ground surface. The data evaluated in the RI indicate no evidence of hydraulic connection between the shallow and regional aquifers beneath the site.

Flow in the first WBZ is controlled by the presence of a localized groundwater mound created by the presence of the containment wall, which prevents discharge of contaminated groundwater associated with the former burn pits and landfill trenches into Peters Canyon Channel. Groundwater in the first WBZ flows first toward the mound and then flows laterally around the mound to the northeast and southwest, and discharges into the upstream and downstream portions of Peters Canyon Channel. However, the migration rate is slow, estimated to be more than 60 years (the estimated travel times for migration routes around the wall are 63 years around the southern end and 75 years around the northern end). Some of the groundwater in the first WBZ is also interpreted to seep vertically into the second WBZ. Until recently, irrigation return flow from the agricultural field (former usage) located west of Jamboree Road was the primary source of recharge to both the first and second WBZs. Currently, infiltration from precipitation is the primary surface recharge source. The Jamboree Road extension and the HDPE liner installed at the base of the backfill prevent vertical recharge of groundwater through the landfill in these areas.

2.4 NATURE AND EXTENT OF CONTAMINATION

This section presents a brief summary of results from investigations conducted to assess and monitor the extent of soil, groundwater, and/or surface water contamination at the site. Previous environmental investigations conducted at OU-3 include the following:

- Confirmation Study (Characterization and Verification), Site 1, Moffett Trenches and Crash Crew Pits (Brown and Caldwell 1985a,b)
- Predesign Study, Site 1, Moffett Trenches and Crash Crew Pits (Brown and Caldwell 1986)
- Draft Remedial Investigation Report for Operable Unit 3 (BNI 1996a)
- Draft Feasibility Study Report for Operable Unit 3 (BNI 1996b)
- Proposed Plan for Operable Unit 3 (SWDIV 1996)
- Final 1997 Annual Groundwater Monitoring Report (BNI 1998)
- Final 1998 Annual Groundwater Monitoring Report (BNI 1999a)
- Final Record of Decision/Remedial Action Plan for Operable Unit 3 (SWDIV 2001)
- Final 1999 Annual Groundwater Monitoring Report (BNI 2000a)
- 2000 Quarterly Groundwater Monitoring Data Summaries: March/April (BNI 2000b), Summer (BNI 2000c), Fall (BNI 2001b)
- Annual Summary Report for Monthly LFG Monitoring (BNI 2001a)
- Final 2000 Annual Groundwater Monitoring Report (BNI 2001c)
- 2001 Quarterly Groundwater Monitoring Data Summaries: Spring (BNI 2001d), Summer (BNI 2001e), Fall (BNI 2002b)

- Draft 2001 Annual Groundwater Monitoring Report (BNI 2002b)

A detailed description of the investigations conducted to date and a summary of the historical analytical data can be found in the OU-3 RI report (BNI 1996a). Data from historical sampling events were incorporated into the nature and extent of contamination section in the RI report and are summarized in Section 5 of the ROD/RAP (SWDIV 2001). Summary statistics for the chemicals of potential concern (COPCs) identified in each affected medium are summarized in the ROD/RAP and in the SSHP (Attachment E).

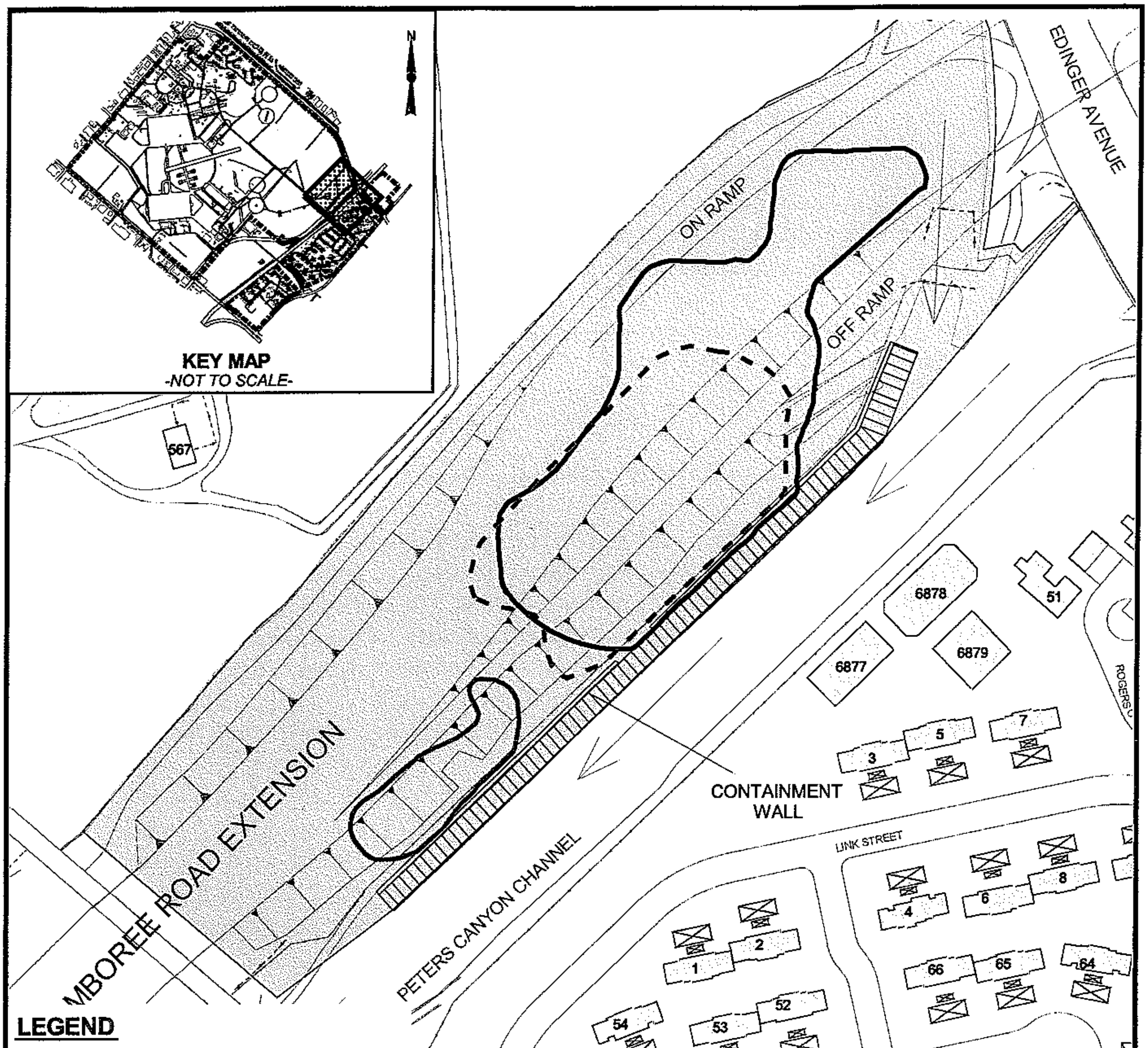
2.4.1 Soil

Figure 2-4 depicts the areal extent of organic and inorganic contamination in subsurface soils (at depths between 10 and 25 feet below former ground surface) based on an evaluation of RI field sampling. The area of soil contamination generally falls within the boundary of the historical disposal area. Given an observed correlation between soil and groundwater contamination at the site, the boundaries of the soil contamination were largely inferred based on the RI groundwater contamination data. Contaminants within the area with soil contamination are generally limited to volatile organic compounds (VOCs) (dichloroethane; benzene, toluene, ethylbenzene, and xylenes; trichloroethene; dichloroethene; and vinyl chloride) and polynuclear aromatic hydrocarbons (naphthalene, acenaphthene, benz[a]anthracene, chrysene, fluoranthene, and phenanthrene) reported in samples from 10 to 15 feet bgs, a depth that corresponds to the approximate depth of the water table. The highest VOC concentration reported was 12,000 micrograms per kilogram of ethylbenzene. Several metals that were reported above background concentrations (arsenic, beryllium, cadmium, chromium, molybdenum, silver, and vanadium) in this area may also represent site-related contamination. The metals concentrations exceeding background were generally found in samples from between 10 and 25 feet bgs. The summary statistics for the organic and inorganic COPCs in soil are summarized in the ROD/RAP and in the SSHP (Attachment E).

Contamination reported in soil samples collected in the former burn pit area reflects residual contamination from the use of JP-5 and other flammable liquids during training exercises. Lower levels of contamination reported in samples outside the burn pit and disposal trench area are attributed to migration of light nonaqueous-phase liquids and groundwater with dissolved-phase contaminants. The overall level of soil contamination—primarily associated with JP-5 and other petroleum hydrocarbons—indicates that subsurface soils may be acting as secondary sources for the contamination of groundwater in the first WBZ (BNI 1996a).

2.4.2 Groundwater

Based on results of groundwater monitoring conducted at the site for the RI during 1995 and 1996, a dissolved-phase-only groundwater contamination plume was interpreted to be present in the first WBZ (BNI 1996a). Subsequent to the RI, quarterly groundwater monitoring was conducted during 1997, 1998, 1999, 2000, and 2001, and results were



LEGEND

- OU-3 SITE BOUNDARY
- EXISTING ROAD OR PAVED AREA
- BUILDING OR STRUCTURE
- AREA ASSOCIATED WITH HISTORIC DISPOSAL TRENCHES OR CRASH CREW BURN PITS
- CONTAINMENT WALL
- ESTIMATED BOUNDARY OF AREAL EXTENT OF GROUNDWATER OR SUBSURFACE SOIL (10 TO 25 FT BELOW GROUND SURFACE) CONTAMINATION
- AREAL EXTENT OF GROUNDWATER OR SUBSURFACE SOIL CONTAMINATION

NOTES:

AREAL EXTENT OF GROUNDWATER AND SUBSURFACE SOIL CONTAMINATION BASED ON THE PRESENCE OF COPC ORGANICS DETECTED IN GROUNDWATER AND SOIL BORING SAMPLES COLLECTED DURING THE 1995-96 RI.

SOURCES:

BASE MAP BASED ON AERIAL SURVEY CONDUCTED BY AIRBORNE SYSTEMS, INC. ON OCTOBER 21, 1990 REVISED BY BECHTEL IN NOVEMBER 1997 TO UPDATE BASE MAP

200 0 200 Feet

N

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Figure 2-4

Areal Extent of Groundwater and Subsurface Soil Contamination

Marine Corps Air Station Tustin, California

Bechtel Environmental, Inc.

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presented in respective annual groundwater monitoring reports (BNI 1998, 1999a, 2000a, 2001c, 2002b). Based on results from these monitoring events, groundwater contamination at OU-3 is generally limited to VOCs and total petroleum hydrocarbons (TPH) as fuel in the first and second WBZs. The majority of groundwater contamination has historically been reported in samples collected within the boundaries of the area associated with the former disposal and burn pit areas. Several metals were also reported at concentrations exceeding site-specific background levels.

Based on data collected during 2001, the estimated current extent of VOC contamination in groundwater in the first and second WBZs is presented on Figures 2-5 and 2-6, respectively (BNI 2002b). The VOC and TPH concentrations reported in 2001 were comparable to or slightly lower than those reported during the baseline monitoring period from 1995 through 1996.

2.4.3 Surface Water

Results of surface water monitoring conducted during 1995 and 1996 are presented in the RI for OU-3 (BNI 1996a). Surface water samples were collected in Peters Canyon Channel upstream from, adjacent to, and immediately downstream of OU-3 in order to determine whether surface water in Peters Canyon Channel had been impacted by releases from the site (Figure 2-3). Upstream surface water monitoring locations were selected to represent site-specific background values. Surface water monitoring results indicate that no potential migration pathways at the site (e.g., discharge of contaminated groundwater or runoff) are actively releasing measurable amounts of site-related contamination to Peters Canyon Channel.

COPC metals and unknown organic compounds were widely detected in the surface water samples collected from locations adjacent to and downstream from OU-3. Similarities in the type and relative magnitude of organic and inorganic COPCs detected in surface water samples collected from upstream monitoring locations and from areas potentially impacted by releases from the site (locations adjacent to and downstream from OU-3) indicate that it is unlikely that the COPCs were derived from OU-3. Summary statistics for COPCs detected in high-flow and low-flow surface water are summarized in the ROD/RAP and in the SSHP (Attachment E).

Based on a comparison of surface water monitoring results from October and December 1995 (which represent low-flow conditions) and from January 1996 (after a storm event, which represents high-flow conditions), flow rate in Peters Canyon Channel appears to have no significant impact on the analytical results for surface water. Upstream surface water sampling results reflect site-specific background concentrations for inorganic compounds detected in surface water.

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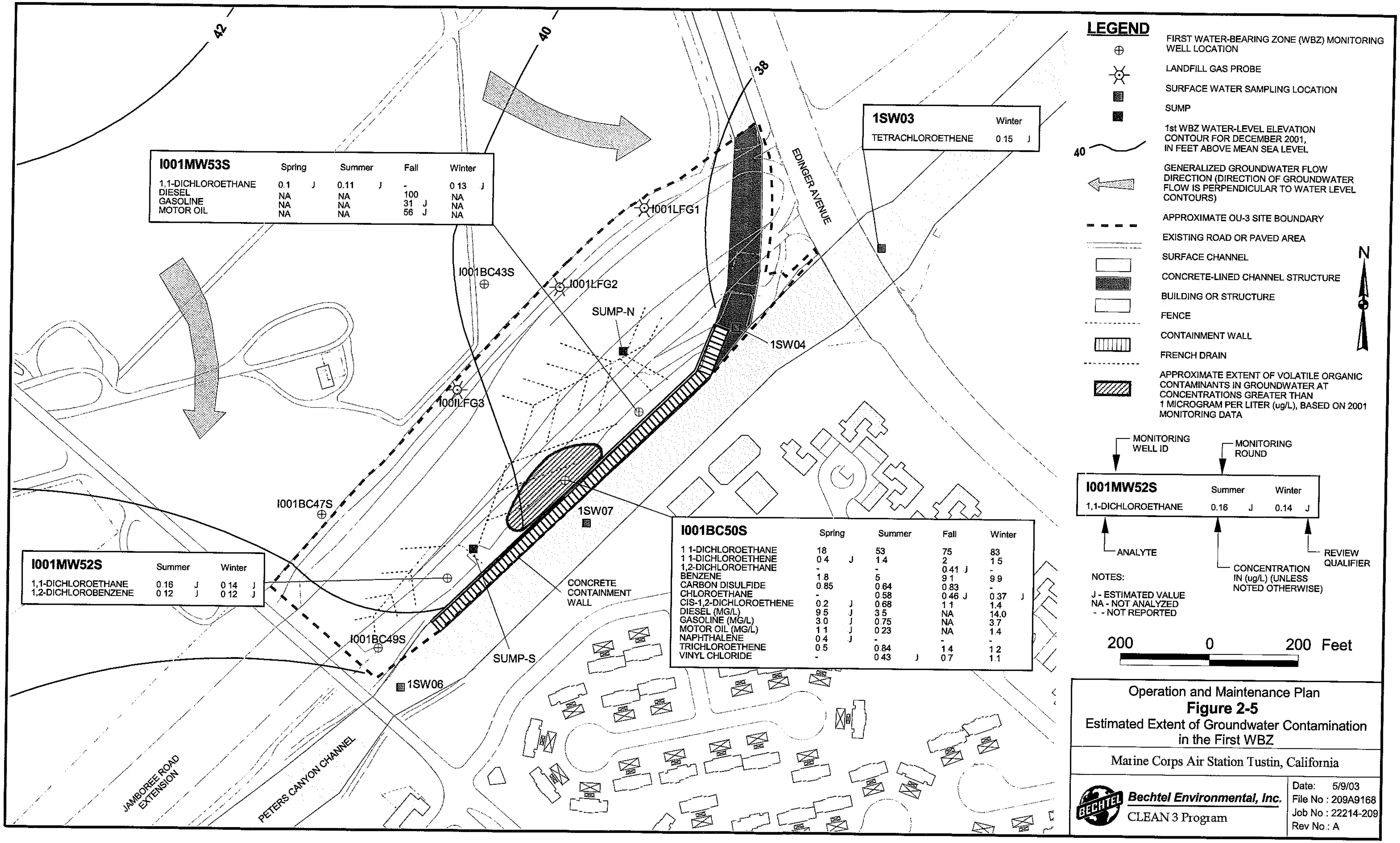

Operation and Maintenance Plan

Figure 2-5

Estimated Extent of Groundwater Contamination in the First WBZ

Marine Corps Air Station Tustin, California

Bechtel Environmental, Inc.
CLEAN 3 Program

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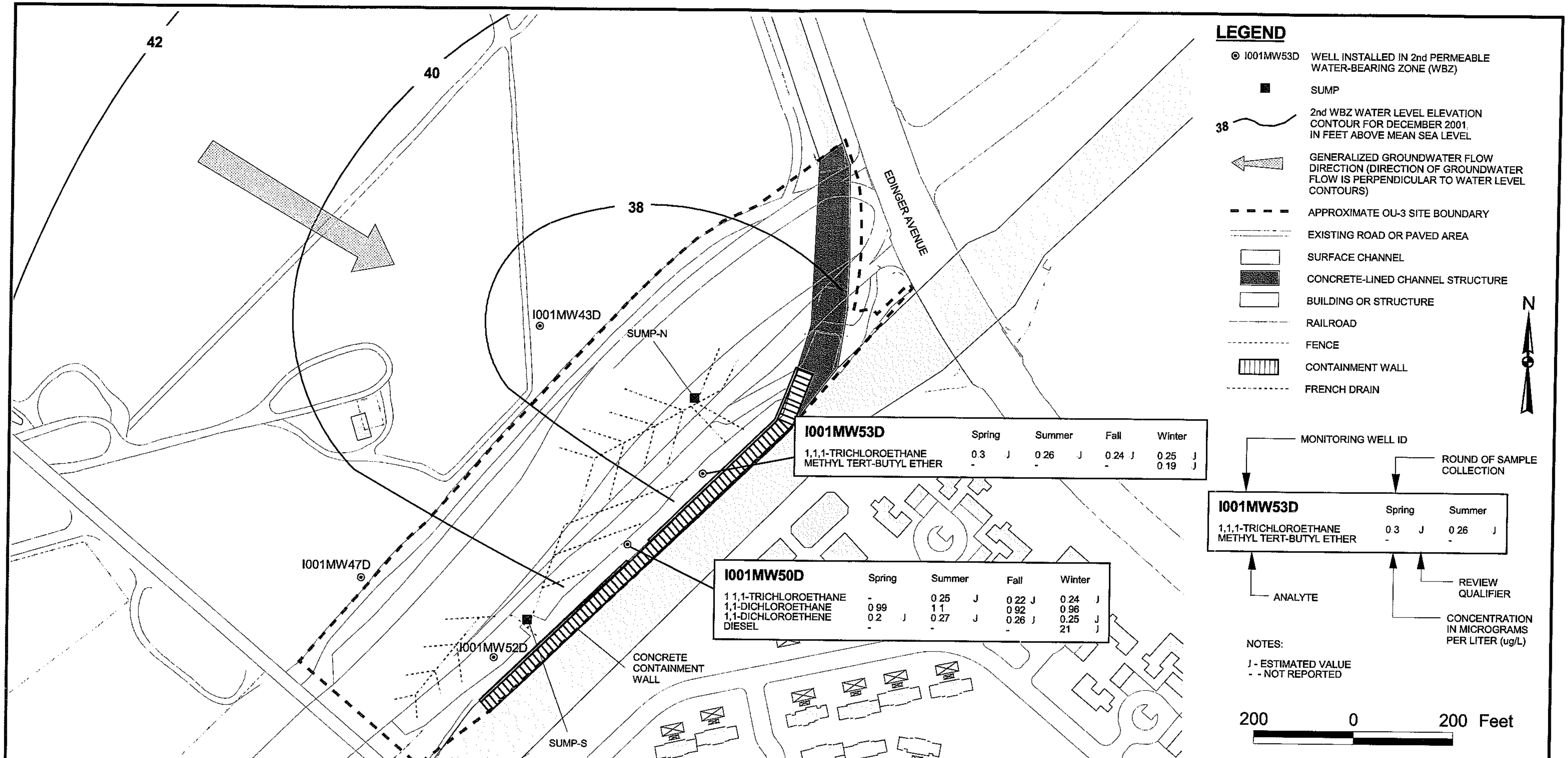

Operation and Maintenance Plan
Figure 2-6
Estimated Extent of Groundwater Contamination in the Second WBZ

Marine Corps Air Station Tustin, California

Bechtel Environmental, Inc.
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Section 3
INSPECTION AND MAINTENANCE PLAN

This inspection and maintenance plan describes the general methods, procedures, and processes that will be used to inspect, maintain, monitor, and document site conditions with the goal of ensuring the integrity of the containment system, preventing exposure to contaminants at the site, and maintaining the structural integrity of monitoring equipment. In addition, results from inspection and maintenance activities will be used to demonstrate that the remedy is "operating properly and successfully." This inspection and maintenance plan includes elements of the land-use controls instituted to prevent the removal of or damage to the engineering controls that are present at the site. The location of engineering controls to be maintained at the site is presented on Figure 3-1. The types of engineering controls to be implemented include the following:

- containment wall and channel bed
- surface cover
- drainage system
- vegetation
- groundwater monitoring wells
- surface water monitoring locations
- LFG monitoring probes
- site security measures

The regulations governing these tasks, based on the ARARs evaluation presented in the ROD/RAP (SWDIV 2001), are as follows.

- Prepare a final postclosure maintenance plan: 27 CCR 21830.
- Inspect and maintain surface cover: 22 CCR 66264.310(b)(1).
- Maintain security: 27 CCR 21135 (f) and (g).
- Maintain integrity of drainage and erosion-control system: 27 CCR 21150.
- Perform postclosure maintenance: 27 CCR 21180.
- Monitor postclosure land use: 27 CCR 21190.
- Maintain wells: Orange County Code, Article 2; Orange County Well Ordinance No. 2607.

3.1 FREQUENCY OF INSPECTIONS AND MAINTENANCE ACTIVITIES

Site inspections and maintenance activities for the engineering controls implemented at the site will be conducted by the DON or its contractor in accordance with the schedule presented in Table 3-1. Site inspections are anticipated to be scheduled to coincide with groundwater and surface water monitoring events, which will occur quarterly for the first year. The monitoring schedule for groundwater and surface water is presented in Section 4. After 1 year of quarterly monitoring is complete, the data will be evaluated and a revised frequency of monitoring may be determined as described in Section 3.3 below. The DON currently has an exemption from LFG monitoring from the CIWMB; however, the condition of the LFG probes will be monitored and maintained during groundwater and surface water monitoring events in accordance with the methods and procedures presented in this section.

3.2 INSPECTION AND MAINTENANCE OF ENGINEERING CONTROLS

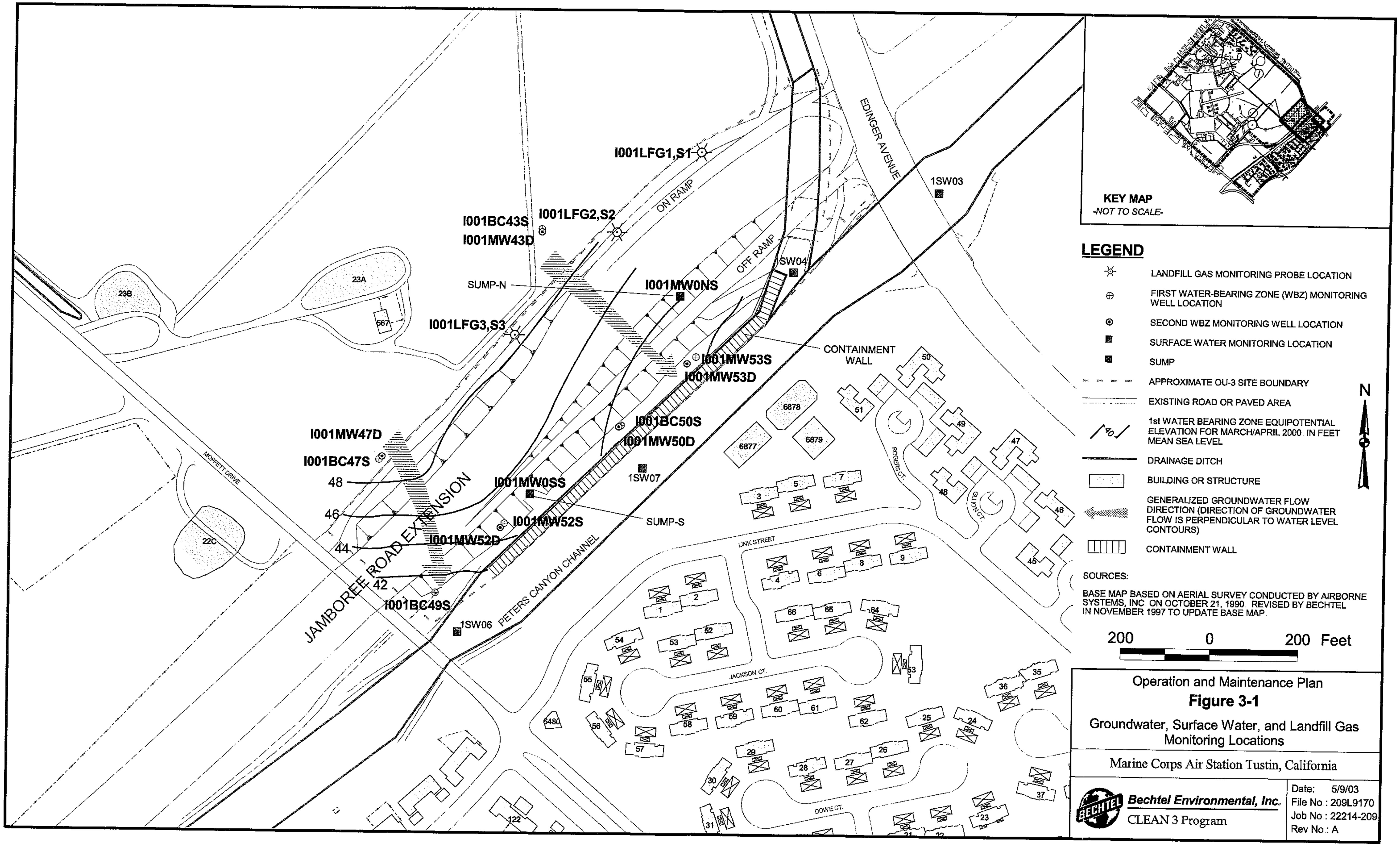
Inspection and maintenance activities for the institutional and engineering controls implemented at the site will be performed in accordance with the schedule presented in Table 3-1, and as described in the sections below.

If, based on results of any site inspection, corrective measures are recommended, the Emergency Response Officer (ERO) should be notified. Repairs will be made to engineering controls at the site as necessary, using methods and materials similar to those used for their original construction. Proposals for destruction of groundwater or LFG monitoring equipment or removal of the containment wall will be reviewed and must receive prior approval by the DON, RWQCB Santa Ana Region, and DTSC. The city of Tustin will be included in the review process for destruction of wells on their property.

3.2.1 Containment Wall and Channel Bed

The containment wall is an integral component of the containment system for contaminated media at the site. The containment wall and channel bed in Peters Canyon Channel adjacent to the landfill will be inspected and maintained on at least an annual basis, and after unusual events such as accidents, earthquakes, or floods (Table 3-1). Observations made during field inspections will be documented on the Landfill Cover, Drainage, and Vegetation Field Inspection Log (Figure 3-2). The containment wall will be visually inspected for cracks, settling, seepage, or other potential damage that may indicate a deterioration of its integrity. Peters Canyon Channel bed will be inspected for the presence of large debris, for excessive erosion or seepage along the base of the containment wall, and for any other conditions that might signify failure of a portion of the wall or indicate damage to its structural integrity. If inspections indicate repairs are necessary, the ERO will be notified and will take appropriate action in accordance with the Emergency Response Plan (ERP) presented in the SSHP (Attachment E). Repairs will be made as necessary, using methods and materials similar to those used for the original construction.

A groundwater transport model has been prepared for the site so that it may be used in the future to assess the potential for groundwater flow and contaminant migration under different land-use scenarios (i.e., removal of the containment wall).



Operation and Maintenance Plan

Figure 3-1

Groundwater, Surface Water, and Landfill Gas Monitoring Locations

Marine Corps Air Station Tustin, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 5/9/03
File No.: 209L9170
Job No.: 22214-209
Rev No.: A

Table 3-1
Inspection Schedule

Structure/Equipment	Inspection Frequency*	Areas of Potential Concern
Containment wall and channel bed	Annually and after unusual events such as extreme storm events, flooding, or earthquakes	Cracks Settling Seepage Channel bed degradation or local scour Other conditions
Surface cover and vegetation	Annually and after unusual events	Erosion Cracks Damaged areas Holes from burrowing animals Soil subsidence Ponded water Bare spots
Drainage system	Annually, before the rainy season, and after heavy rainfall	Siltation Debris clogging Riprap at drainage outlets in place Choking by overgrown vegetation Other damage
Site security	During each monitoring event	Structural damage Weathering Vandalism Missing/weathered signs
Monitoring wells	During each monitoring event	Cracks Broken concrete aprons Damaged/disturbed well cover Malfunctioning caps and/or locking mechanism Damaged casing Obstructions in the well Accumulated surface water in well box Other conditions
Landfill gas probes	During each monitoring event	Broken vault boxes/covers Broken valves or fittings Dismantled or missing ID tags Damaged casing Obstructions in the well Accumulated surface water in well box Other conditions
Surface water monitoring equipment	During each monitoring event	Missing equipment

Note:
* inspections will occur quarterly during the first year of long-term monitoring

LANDFILL COVER, DRAINAGE, AND VEGETATION FIELD INSPECTION LOG

Inspected By: ______________________ Date: ______________________

Item	Observation	Yes	No*	Comment or Note Number
1.	Containment wall intact? Cracks absent? Settling absent? Seepage from wall absent? Other damage that may compromise integrity of wall absent? If no, describe nature.			
2.	Cover surface intact? Erosion absent? Cracking absent? If no, describe nature of cracks (length, width, depth). Damaged areas absent? (Example: from vehicle traffic) Holes from burrowing animals absent? Soil subsidence (greater than 2 inches in depth over an area less than 25 square feet) absent? If no, document location on a map. Ponded water absent?			
3.	Drainage systems in good condition? Excessive silting or debris clogging? If yes, indicate location on map. Channel banks not eroded? Riprap at drainage outlets staying in place? Choking by overgrown vegetation absent?			
4.	Is vegetation coverage adequate? Bare spots (greater than 1 foot) absent?			
5.	Is vegetation less than 1 inch in diameter? Has mowing/trimming been sufficient to protect integrity of cover?			
6.	Describe weather conditions from past 7 days.	NA	NA	

Note:
* a "No" response requires a comment to define corrective action required

Figure 3-2
Landfill Cover, Drainage, and Vegetation
Field Inspection Log

(figure continues)

Figure 3-2 (continued)

Describe unsatisfactory conditions in more detail below. Suggest corrective actions, if needed. Include a sketch or photograph when appropriate.

Notes:

3.2.2 Surface Cover

Currently, the land surface at the site is mostly covered by the Jamboree Road extension, including its northbound on-ramp and southbound off-ramp. Unpaved areas exist on the western portion of the site. Observations made during field inspections on the condition of the surface including but not limited to land-use changes and any evidence for erosion or settlement will be documented on the field inspection log (Figure 3-2).

Inspections will be performed by the DON or its contractor. In the event that corrective measures may be necessary, the ERO will be notified and will take appropriate action in accordance with the ERP presented in the SSHP (Attachment E). Repairs will be made as necessary, using methods and materials similar to those used for the original construction. Settlement will be monitored by a visual inspection of the cover system for cracks, eroded areas, surface irregularities, subsidence, and localized depressions. Maintenance will consist of filling and compacting cracks and eroded areas with materials compatible with the
original cover.

After a heavy rainfall (e.g., in excess of 2 inches in 24 hours) or other extreme storm event, the cover will be inspected for irregularities. Areas that have subsided, settled, or eroded due to weather conditions will be repaired to original grade. Localized depressions will be filled with an appropriate type of final-cover material and will be graded to drain. Over time, areas that have subsided or settled and require excessive repair will be closely examined to determine the cause of the displacement before repairs are made.

The entire covered areas, including the top surface and side slopes along Jamboree Road, will be inspected for evidence of erosion. Areas of erosion will be evaluated to determine whether water diversion will reduce future damage. Eroded areas will be repaired by backfilling, recompacting, and restoring the area, as needed, to its original configuration.

3.2.3 Drainage System

Surface drainage has been addressed through the engineering design of Jamboree Road and the access ramps. The drainage system includes benching and landscaping. Surface water is directed away from OU-3 by the elevated portion of Jamboree Road. Subsurface drainage consists of a fish-bone French drain system with two sumps to collect the groundwater.

Drainage systems will be visually inspected before the rainy season and after unusually heavy rainfall events for siltation, debris clogging, or other damage such as excessive erosion. Drainage courses located at the top and around the perimeter of the landfill cover, and on the riprap at the downdrain outlets will be inspected for erosion or washout, siltation, or other damage. Observations made during these field inspections including suggestions for maintenance or repairs will be documented on the field inspection log

(Figure 3-2). Maintenance activities may include cleaning silt or other debris from channels or sumps, regrading channel flow lines, reseeding slopes, and if necessary, relining damaged portions of the channels. Repairs will be made as necessary, using methods and materials similar to those used for the original construction.

3.2.4 Vegetation

The entire surface area at the site will be inspected for evidence of damage due to sheet and/or rill erosion and for areas of sparse or dead vegetation. Observation during these field inspections including suggestions for maintenance or repairs will be documented on the field inspection log (Figure 3-2). If evidence of erosion is found, these areas will be evaluated to determine whether water diversion would reduce future damage. Slopes or eroded areas with sparse or dead vegetation may be repaired by removing, replacing, and reseeding, as necessary, with a blend of appropriate shallow-rooted plants, whose root systems will not threaten the integrity of the cover. Plant growth identified as harmful will be sprayed with herbicide and removed. Observations of maximum vegetation size and the sufficiency of mowing/trimming to protect the integrity of the landfill cover will also be documented in Figure 3-2. General observations of weather conditions occurring seven days prior to the inspection will also be noted on Figure 3-2, as it may impact the overall observations made during the inspections.

3.2.5 Groundwater Monitoring Network

The condition of the 11 groundwater monitoring wells at the site will be inspected during each groundwater monitoring event and after unusual events such as heavy rainfalls or after earthquakes or flooding. Each groundwater monitoring well will be inspected for cracks or broken concrete apron, damaged or disturbed well cover, malfunctioning cap and/or locking mechanism, damaged casing, obstructions in the well (which could indicate a failed casing), accumulated surface water in the well box, and any other relevant conditions. Field observations made on the condition of the monitoring wells including any recommendations for maintenance or repairs will be documented on the Monitoring Well and Landfill Gas Probe Field Inspection Log (Figure 3-3). If practicable, minor repairs to the monitoring wells may be made during the inspection.

If the field inspection indicates that the integrity of any of the monitoring wells may have been compromised, then corrective measures are required to maintain their operable condition. If the integrity of any well is compromised, as may be indicated by severe surficial erosion or by sudden, unexplainable deterioration in sample quantity or quality (excessive silt, turbidity, flow rate, or changes in water color), the condition of the well will be further evaluated. Upon further evaluation, a monitoring well may be reconditioned or redeveloped to restore it to an operational condition. If attempts to redevelop or recondition any damaged wells are unsuccessful, installation of replacement wells may be required. Plans for installation of proposed replacement wells, as necessary, will be submitted to the RWQCB and other regulatory agencies for prior approval. The city of Tustin will be included in the review process for destruction of wells on their property.

MONITORING WELL AND LANDFILL GAS PROBE FIELD INSPECTION LOG

Inspected By: ____________________________ Date: ______________________________

Item	Observation	Yes	No*	Comment (Include Well or Probe ID Number)
1.	Monitoring well in good condition? Cracks absent? Concrete apron intact? Well cover undamaged and undisturbed? Well caps and/or locking mechanisms functioning? Casing undamaged? Well casing unobstructed? Well box free of accumulated surface water? Any other relevant conditions?			
2.	Landfill gas probe in good condition? Vault boxes and covers unbroken? Valves and fittings unbroken? Identification tags present? Probe piping undamaged? Is negative pressure absent in probe prior to sampling for the presence of landfill gas? Is stressed vegetation absent in the vicinity of the probe? Any other damage noted?			

Note:
* a "No" response requires a comment to define corrective action required where appropriate

Figure 3-3
Monitoring Well and Landfill Gas Probe
Field Inspection Log

(figure continues)

Figure 3-3 (continued)

Describe unsatisfactory conditions in more detail below. Suggest corrective actions, if needed. Include a sketch or photograph when appropriate.

Notes:

3.2.6 Landfill Gas Monitoring Probes

The condition of the three LFG monitoring probes will be inspected for structural integrity and suitability for monitoring during each LFG monitoring event (if required) and every groundwater and surface water monitoring event. The LFG probes will be inspected for broken vault boxes or covers, broken valves or fittings, dismantled or missing identification tags, broken or damaged probe piping, or other damage. Field observations made during the inspections, including recommendations for maintenance or repairs, will be documented on the field inspection log (Figure 3-3).

During monitoring events, and if required prior to sample collection, the LFG probes will be monitored for negative pressure. Probes that are damaged or are under negative pressure are considered inadequate for monitoring. A simple method to check for negative pressure is to place a piece of paper just above the probe opening and observe whether the paper is drawn into the opening. Broken or damaged vault boxes, valves, or probes will be replaced as required to maintain the integrity and operable condition of the LFG probes.

3.2.7 Site Security

Site security features including fencing, gates, locks, and signs will be installed prior to implementing the OMP. Site security features will be inspected for structural damage, weathering, vandalism, and missing or weathered warning signs. Field observations made during the inspections including recommendations for maintenance or repairs will be documented on the Site Security Field Inspection Log (Figure 3-4). Site security features are identified on Figure 3-5.

The gate hinges will be lubricated as needed during the inspection. Small damaged sections will be repaired using material similar to that used for its original construction. Larger damaged sections will be replaced with material of at least the same quality as the original. Signs will be constructed of metal or plastic and will be placed at appropriate locations around the site and maintained on an as-needed basis. One sign, the postclosure sign for OU-3, similar to Figure 3-6, will include a local telephone number for emergency notification, and will indicate where a copy of the OMP will be available for public inspection. The postclosure sign for OU-3 will be maintained in a legible and upright condition throughout the LTM period.

3.3 REPORTING REQUIREMENTS

Reports summarizing results of field inspections and maintenance activities conducted for each monitoring event will be prepared and submitted to the regulatory agencies for review. These summary reports will include all completed field inspection logs (Figures 3-2 to 3-4), including recommendations for additional maintenance or engineering controls. The DON will maintain permanent records of all on-site inspections and maintenance activities.

Site Security Field Inspection Log

Inspected By: ______________________________ Date: ________________________________

Item	Observation	Yes	No*	Comment
1.	Perimeter fence in good condition? Vandalism damage absent? No litter across site? Warning signs in place?			
2.	Gates in good condition? Locks present? Gate swings open and closed easily?			

Note: * a "No" response requires a comment to define corrective action required

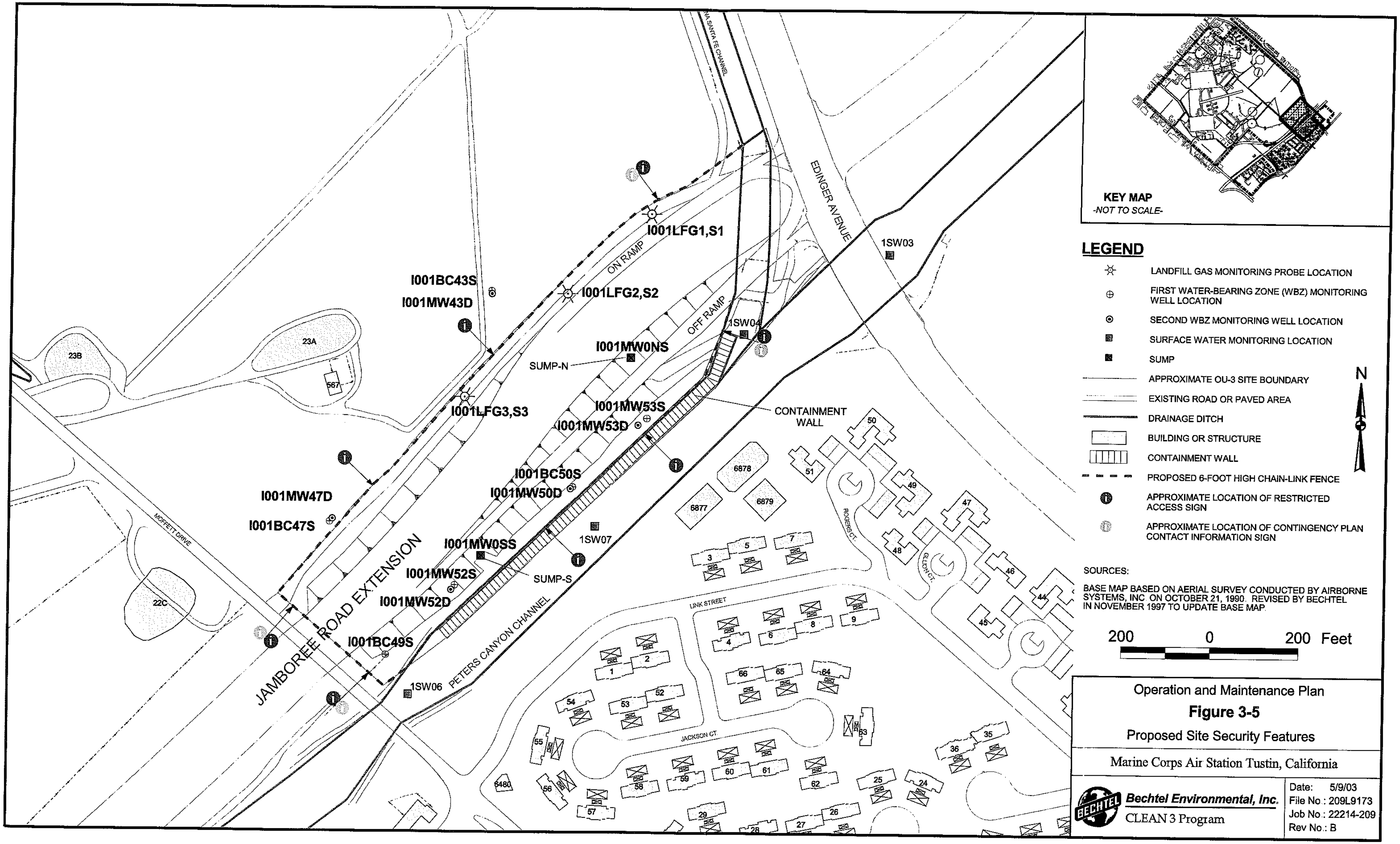
Describe unsatisfactory conditions in more detail below. Suggest corrective actions, if needed. Include a sketch or photograph when appropriate.

Notes:

Figure 3-4
Site Security Field Inspection Log

If the results from inspections and monitoring events indicate that the remedy is ineffective, the DON will notify the DTSC and RWQCB verbally within 5 days of receipt of the data and will initiate corrective measures, as appropriate. Corrective measures could include repairs to the containment wall, eroded areas in the surface cover, the drainage system, and damaged well vaults; removal of unwanted plant growth; or reconditioning or replacement of damaged wells. Other corrective measures not listed here may also be taken if deemed necessary.

If the results of inspections and monitoring indicate that the remedy including the institutional and engineering controls is effective, it will be recommended that sampling and monitoring continue on a semiannual basis until the end of the fifth year. As part of CERCLA, 5-year reviews will be conducted to verify the successful performance of the remedy. At the end of the fifth year and as part of the 5-year review, the inspection and maintenance plan will be reviewed and amended or revised, if appropriate. If the inspections indicate that either the institutional or engineering controls are not effective, then corrective measures will be taken, and may include an increased frequency of inspections and monitoring events.



Operation and Maintenance Plan

Figure 3-5

Proposed Site Security Features

Marine Corps Air Station Tustin, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 5/9/03
File No : 209L9173
Job No : 22214-209
Rev No : B

FEDERAL PROPERTY

NO UNAUTHORIZED ACCESS

IN CASE OF EMERGENCY
PLEASE NOTIFY THE
EMERGENCY RESPONSE OFFICER:
MR. JERRY DUNAWAY
AT

(619) 533-0975

THE OPERATION AND MAINTENANCE PLAN AND REMEDIAL IMPLEMENTATION PLAN MAY BE VIEWED AT:

UNIVERSITY OF CALIFORNIA AT IRVINE
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Figure 3-6
Postclosure Sign for OU-3

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Section 4
LONG-TERM MONITORING PLAN

The LTMP described in this section will be implemented to meet the RAOs summarized in Section 1 of this OMP. A detailed discussion of the selection of the final remedy for OU-3, as well as required components for LTM, is presented in the ROD/RAP (SWDIV 2001).

Activities to be conducted during the LTM program at the site include groundwater and surface water monitoring, LFG monitoring (if required), and data interpretation and reporting. The DON currently has an exemption from the CIWMB for LFG monitoring. The methods and procedures for LFG monitoring are included in this section for completeness, in the event LFG monitoring is required in the future. These monitoring and reporting activities are necessary to assess and to assure the continued effectiveness of the remedy and to provide data in support of proposed modifications to remedial activities conducted at the site, if necessary. The following sections summarize sampling, analysis, data evaluation, and reporting requirements for the LTM activities. Groundwater, surface water, and LFG monitoring activities and data management will be conducted in accordance with the detailed descriptions provided in the following plans that are included as attachments to this OMP:

- Attachment A, FSP
- Attachment B, QAPP
- Attachment C, DMP
- Attachment D, IDWMP
- Attachment E, SSHP

4.1 GROUNDWATER MONITORING

A total of 11 monitoring wells are included in the groundwater monitoring program: 6 wells installed in the first WBZ (I001BC43S, I001BC47S, I001BC49S, I001BC50S, I001BC52S, and I001BC53S) and 5 wells installed in the second WBZ (I001MW43D, I001MW47D, I001MW50D, I001MW52D, and I001MW53D) (Figure 3-1). In addition to the 11 groundwater monitoring wells, 2 sumps (I001MW0NS and I001MW0SS) installed in the first WBZ were previously included in the monitoring program. The two sumps were removed from the sampling schedule after the December 1999 groundwater monitoring round conducted at MCAS Tustin. However, the condition of the sumps will be monitored and maintained to ensure that they can be used in the event they are needed in the future.

The groundwater monitoring program implemented at OU-3, including the number and locations of monitoring wells and analytical schedule, was designed in part to meet the following objectives:

- monitor the lateral and vertical extent of contamination
- determine the impact on beneficial uses and the threat to nearby receptors
- monitor the rate and direction of horizontal and vertical plume movement
- validate and optimize the effectiveness of groundwater remedial measures

- initiate long-term performance monitoring to meet the OU-3 ROD monitoring requirements
- determine when remedial objectives have been met

To meet the above objectives, monitoring wells have been installed in background, crossgradient, in-plume, and downgradient locations, in each of the first two WBZs (Table 4-1). Two and three wells were placed in the downgradient plume tips in the first and second WBZs, respectively. One crossgradient well was placed in the first WBZ to track the crossgradient plume boundary and to define the horizontal hydraulic gradient. Two background wells were located in the first and second WBZs to define the upgradient water quality for comparison to the downgradient data. One in-plume well was located in the first WBZ to collect water chemistry data to support the remedial design. The effectiveness of the monitoring well network has been reviewed, and modifications to the groundwater analytical schedule for OU-3 have been recommended as a part of groundwater monitoring data evaluations as described in annual groundwater monitoring reports for MCAS Tustin (BNI 1998, 1999a, 2000a, 2001c, 2002b), and summarized in Addendum 3 of the basewide groundwater monitoring plan (BNI 2001f). Future modifications to the groundwater analytical schedule and LTM activities for OU-3 may be made, based on evaluation of LTM results, during the annual and detailed 5-year reviews. As indicated in the final OU-3 ROD/RAP (SWDIV 2001), if any additional monitoring wells or equipment beyond those identified above are determined to be necessary, they will be installed, monitored, inspected, maintained, and repaired consistent with this OMP and the current land use or the planned land use authorized in an approved local reuse or land-use plan.

4.1.1 Groundwater Sampling

The wells to be monitored, the sampling frequency, and the analytical schedule are presented in Table 4-1. This schedule provides continuity with the sampling methods and detection limits that have been used during prior years for groundwater monitoring. Table 4-2 summarizes the sample containers, preservatives, and holding times associated with each of these methods. Groundwater monitoring will be performed quarterly for the first year. The frequency of monitoring is subject to review and modification, based on evaluation of ongoing results. Annual reviews and 5-year detailed reviews are the mechanisms for recommending modifications to the groundwater monitoring program, as discussed in Section 4.4 of this OMP.

Groundwater monitoring will be conducted in accordance with the methods and procedures described in the FSP (Attachment A). During each groundwater monitoring event, water levels in each of the monitoring wells and sumps will be measured prior to purging and sampling. Groundwater samples will then be collected and transmitted to the laboratory and analyzed for VOCs using U.S. EPA Method 8260B, for TPH as fuel using U.S. EPA Method 8015-M, and/or for target analyte list (TAL) metals using U.S. EPA Method 6000/7000 series (Table 4-1). In addition, the following general water quality parameters will be measured: pH, dissolved oxygen, and oxidation-reduction potential

Table 4-1
Analytical Testing Schedule and Sampling Parameters

Station Identification	Monitoring Zone	Relative Location	QUARTER 1		QUARTER 2				QUARTER 3		QUARTER 4		
			VOCs[a]	TPH-Fuel[b]	VOCs	TAL Metals[c]	Water Chemistry[d]	TPH-Fuel	VOCs	TPH-Fuel	VOCs	TAL Metals	TPH-Fuel
Groundwater[e]													
I001BC43S	First WBZ	Background				X	X						
I001BC47S	First WBZ	Background				X	X						
I001BC49S	First WBZ	Downgradient			X	X	X				X	X	
I001BC50S	First WBZ	In plume			X	X	X	X			X	X	X
I001MW52S	First WBZ	In plume			X	X	X				X	X	
I001MW53S	First WBZ	In plume	X		X	X	X		X		X	X	
I001MW43D	Second WBZ	Background				X	X						
I001MW47D	Second WBZ	Background				X	X						
I001MW50D	Second WBZ	In plume			X	X	X	X			X		X
I001MW52D	Second WBZ	Downgradient			X	X	X						
I001MW53D	Second WBZ	In plume			X	X	X				X		
Surface Water													
1SW03	First WBZ	Upstream	X		X				X		X		
1SW04	First WBZ	Adjacent	X		X				X		X		
1SW06	First WBZ	Downstream	X		X				X		X		
1SW07	First WBZ	Adjacent	X		X				X		X		

Notes:
- [a] VOC analyses will be performed on groundwater and surface water samples using U.S. EPA Method 8260B (or equivalent), and (if required) on landfill gas samples using an organic vapor analyzer; if total VOCs in individual landfill gas samples exceed 500 parts per million, then soil gas samples will be collected and analyzed for total VOCs using U.S. EPA Method TO-14, and for methane using ASTM D1945
- [b] TPH-fuel analyses will be performed using U.S. EPA Method 8015-M
- [c] TAL metals analyses will be performed using U.S. EPA Method 6000/7000 series
- [d] water chemistry analyses include common anions (chloride, nitrate, phosphate, and sulfate) analyzed using U.S. EPA Method 300.0, alkalinity using U.S. EPA Method 310.1, and total dissolved solids using U.S. EPA Method 160.1
- [e] the analytical schedule for groundwater monitoring was taken from Addendum No. 3 to the draft final Interim Basewide Groundwater Monitoring Plan (BNI 2001f) with revisions approved by the Base Closure Team during a November 2001 meeting; these revisions are presented in the 2002 Sampling and Analysis Schedule in the 2001 draft Annual Groundwater Monitoring Report (BNI 2002b)

Acronyms/Abbreviations:
- ASTM – American Society for Testing and Materials
- TAL – target analyte list
- TPH – total petroleum hydrocarbons
- U.S. EPA – United States Environmental Protection Agency
- VOC – volatile organic compound
- WBZ – water-bearing zone

Table 4-2
Sample Containers, Preservatives, and Holding Times

Analyte	Container	Preservative	Holding Time
Volatile organic compounds	3 × 40 mL VOA vials	Cool to 4 °C, HCl to pH < 2	14 days
Total petroleum hydrocarbons	2 × 1 liter amber glass	Cool to 4 °C, HCl to pH < 2	7/40 days*
Target analyte list metals	1 × 1 liter plastic	Cool to 4 °C, 5 milliliters of 0.1 M nitric acid	6 months except mercury 28 days
Alkalinity	1 × 500 mL plastic	Cool to 4 °C	14 days
Total dissolved solids	1 liter plastic	Cool to 4 °C	7 days
Anions (except nitrate)	1 liter plastic	Cool to 4 °C	28 days
Nitrate	1 liter plastic	Cool to 4 °C	48 hours
Volatile organic compounds (LFG monitoring)	Summa® canister	None required	14 days

Note:
* 7 days to extract, 40 days to analyze

Acronyms/Abbreviations:
°C – degrees Celsius
HCl – hydrochloric acid
LFG – landfill gas
mL – milliliter
VOA – volatile organic analyte

using a field instrument; total dissolved solids (TDS) using U.S. EPA Method 160.1; common anions (chloride, nitrate, phosphate, and sulfate) using U.S. EPA Method 300; and alkalinity using U.S. EPA Method 310.1.

Analytical methods, target detection limits, and project-specific remediation goals for chemicals of concern (COCs) and other chemicals identified in groundwater at the site are summarized in Table 4-3. COCs for OU-3 are limited to specific chemicals in groundwater that have been identified as risk drivers at the site. The risk assessment for OU-3 concluded that exposure to soil, surface water, and sediment does not pose an unacceptable risk. Therefore, chemicals present in these media do not require remedial action. Groundwater COCs that have been identified at the site consist of VOCs including chlorobenzene, 1,2-dichlorobenzene (DCB), 1,4-DCB, and metals including antimony, arsenic, cadmium, manganese, molybdenum, and thallium. Other chemicals reported in groundwater that have remediation goals established in the ROD for OU-3 include benzene, 1,1-dichloroethane, 1,1-dichloroethene, ethylbenzene, trichloroethene, and vinyl chloride.

Table 4-3
Analytical Methods, Target Method Detection Limits, and Site-Specific Action Levels for Groundwater and Surface Water
(limits and action levels reported in micrograms per liter)

Analyte	Analytical Method	Target Method Detection Limit	Site-Specific Action Levels	Basis
Volatile Organic Compounds				
Benzene[a]	U.S. EPA 8260B	0.5	1	California MCL[b]
Chlorobenzene	U.S. EPA 8260B	0.5	70	California MCL
1,2-Dichlorobenzene	U.S. EPA 8260B	0.5	600	SDWA MCL[c]
1,4-Dichlorobenzene	U.S. EPA 8260B	0.5	5	California MCL
1,1-Dichloroethane[a]	U.S. EPA 8260B	0.5	5	California MCL
1,1-Dichloroethene[a]	U.S. EPA 8260B	0.5	6	California MCL
Ethylbenzene[a]	U.S. EPA 8260B	0.5	700	SDWA MCL
Trichloroethene[a]	U.S. EPA 8260B	0.5	5	SDWA MCL
Vinyl chloride[a]	U.S. EPA 8260B	0.5	0.5	California MCL
Metals				
Antimony	U.S. EPA CLP	20	6	California MCL
Arsenic	U.S. EPA CLP	1	50	SDWA MCL
Cadmium	U.S. EPA CLP	4	5	SDWA MCL
Manganese	U.S. EPA CLP	2	2,630	Background[d]
Molybdenum	U.S. EPA CLP	0.03	917	Background[e]
Thallium	U.S. EPA CLP	1	4.1	Background[e]

Notes:
- [a] not a chemical of concern for the site; however, a remediation goal for this chemical was established in the ROD/RAP for OU-3
- [b] California MCLs are: 22 CCR 64444 (organics), 64431 (inorganics)
- [c] SDWA MCLs are: 40 CFR 141.61 (organics), 141.62 (inorganics)
- [d] action level based on background concentrations established during the remedial investigation for OU-1 and OU-2
- [e] action level based on background concentrations established at upgradient wells during the OU-3 remedial investigation

Acronyms/Abbreviations:
- CCR – *California Code of Regulations*
- CFR – *Code of Federal Regulations*
- CLP – (U.S. EPA) Contract Laboratory Program
- MCL – maximum contaminant level
- OU – operable unit
- RAP – remedial action plan
- ROD – record of decision
- SDWA – Safe Drinking Water Act
- U.S. EPA – United States Environmental Protection Agency

4.1.2 Data Evaluation

The final remedy is expected to stabilize or decrease concentrations of COCs in groundwater at the site. Data evaluation, as described below, will be performed to monitor concentrations of VOCs and metals over time and to determine whether groundwater with COCs or other chemicals at concentrations exceeding site-specific action levels is migrating beyond site boundaries. Evaluation of groundwater data will include a review of water-level and groundwater elevation data, and analytical data including time-series concentration plots and trigger and/or warning levels, for each of the 11 groundwater monitoring wells at the site. Trigger and warning levels, as defined below, are intended to be conservative values and to provide an early indication of changes in groundwater quality at the site (Table 4-4).

Water-level elevation contour maps will be prepared for each groundwater monitoring event. In addition to water-level elevation contour maps, time-series concentration plots for each of the monitoring wells and plume maps illustrating the areal extent of groundwater contamination in each WBZ will be prepared for detailed annual and 5-year reviews.

Analytical data will be evaluated by reviewing and comparing results for VOCs and metals reported in groundwater samples to "trigger levels" and "warning levels" defined for chemicals with site-specific action levels at the site (Table 4-4). Trigger levels for VOCs that have not been previously reported in a monitoring well are, by default, defined as one-half of the respective site-specific action level established for each chemical. Warning levels for VOCs that have been previously reported in a monitoring well at concentrations exceeding their site-specific action levels are defined as the preliminary baseline (mean) concentration plus 1.5 times the standard deviation of the mean.

Trigger and warning levels for metals are defined only for filtered groundwater samples. Trigger levels for metals that have not been reported at concentrations exceeding their respective site-specific action levels are, by default, defined as their site-specific action level (Tables 4-3 and 4-4). Warning levels for metals that have been previously reported in monitoring wells at concentrations exceeding their site-specific action levels are defined similarly to trigger levels for VOCs, as the preliminary baseline concentration plus 1.5 times the standard deviation of the mean.

Preliminary baseline concentrations are calculated as the arithmetic mean concentration for each chemical from groundwater data available to date (Winter of 2001). The mean concentration is calculated using one-half the reporting limit for any nondetected values in the sample population. Preliminary baseline concentrations and trigger and warning levels will be recalculated each time groundwater data are available until the remedy is shown to be "operating properly and successfully." At that time, the baseline will be finalized and used as a basis for the comparison of the future groundwater monitoring results. After the remedy is shown to be "operating properly and successfully," the arithmetic mean and standard deviation will be recalculated based on subsequent sampling events. Future mean and standard deviation calculations will be compared to the final baseline.

Table 4-4
Trigger and Warning Levels for Groundwater
(results reported in micrograms per liter)

WELL IDENTIFIER	VOLATILE ORGANIC COMPOUNDS									METALS					
	Benzene	Chlorobenzene	1,2-DCB	1,4-DCB	1,1-DCA	1,1-DCE	Ethylbenzene	TCE	Vinyl Chloride	Antimony	Arsenic	Cadmium	Manganese	Molybdenum	Thallium
TRIGGER LEVEL[a] (Default Value)	0.5	35	300	2.5	2.5	3.0	350	2.5	0.25	6	50	5	2,630	917	4.1
I001BC43S	—[b]	—	—	—	—	—	—	—	—	—	—	—	—	—	—
I001MW43D	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
I001BC47S	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
I001MW47D	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
I001BC49S	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6.6[c]
I001BC50S	15.5[c]	—	—	—	124.3[c]	5.0[c]	—	3.0[c]	0.9[c]	13.6[c]	66.2[c]	8.4[c]	—	—	11.1[c]
I001MW50D	—	—	—	—	3.9[c]	—	—	—	—	—	—	—	—	—	10.2[c]
I001MW52S	—	—	—	—	—	—	—	—	—	—	—	—	4,350[d]	—	—
I001MW52D	—	—	—	—	—	—	—	—	—	—	—	10.9[c]	—	—	
I001MW53S	2.3[c]	—	—	—	—	—	—	—	0.3[c]	—	98.2[c]	—	—	—	—
I001MW53D	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Notes:

[a] trigger levels for VOCs that have not been previously reported in monitoring wells are, by default, one-half the respective site-specific remediation goal; trigger levels for metals that have not been previously reported in monitoring wells at concentrations exceeding respective site-specific remediation goals are, by default, defined as the site-specific remediation goal; site-specific remediation goals are presented in Table 4-3

[b] dash indicates trigger level is default value for the VOC or metal as presented in the first row of this table and as described in footnote (a) above

[c] warning levels defined for VOCs that have been previously reported in monitoring wells at concentrations exceeding one-half the respective site-specific remediation goal are calculated as the baseline (mean) concentration plus 1.5 times the standard deviation of the mean; warning levels are listed for metals that have been reported in monitoring wells at concentrations exceeding the site-specific remediation goal, defined similarly to warning levels for VOCs as the mean concentration plus 1.5 times the standard deviation of the mean; summary statistics for warning levels were calculated from reported concentrations of chemicals (in micrograms per liter) including the number of detections/total number of samples (prevalence); preliminary baseline arithmetic mean (mean), range of concentrations (range), and standard deviation (STD) for each well:
I001BC49S: thallium (prevalence = 2/4; mean = 2.8; range = 1–6.3; STD = 2.5)
I001BC50S: benzene (prevalence = 21/22; mean = 7.4; range = 0.25–22; STD = 5.4); 1,1-DCA (prevalence = 22/22; mean = 74.1; range = 18–130; STD = 33.4); 1,1-DCE (prevalence = 21/22; mean = 2.3; range = 0.25–8.0; STD = 1.8); TCE (prevalence = 21/22; mean = 1.5; range = 0.25–4.0; STD = 1.0); vinyl chloride (prevalence = 12/22; mean = 0.5; range = 0.25–1.2; STD = 0.3); antimony (prevalence = 6/7; mean = 7.8; range = 3–14.3; STD = 3.8); arsenic (prevalence = 6/6; mean = 27.8; range = 8–77.3; STD = 25.6); cadmium (prevalence = 3/6; mean = 3.2; range = 1–7.2; STD = 3.5); thallium (prevalence = 3/6; mean = 5.3; range = 1–8.6; STD = 3.9)
I001MW50D: 1,1-DCA (prevalence = 18/22; mean = 1.4; range = 0.25–7.5; STD = 1.6); thallium (prevalence = 2/3; mean = 3.6; range = 0.5–6.7; STD = 4.4)
I001MW52D: cadmium (prevalence = 4/6; mean = 7.5; range = 5.3–10.1; STD = 2.3)
I001MW53S: benzene (prevalence = 2/20; mean = 0.5; range = 0.25–5.5; STD = 1.2); vinyl chloride (prevalence = 1/22; mean = 0.3; range = 0.25–0.3; STD = 0.01); arsenic (prevalence = 2/2; mean = 45; range = 20–70.1; STD = 35.4)

[d] manganese was reported in only one filtered sample from this well; reported concentrations of manganese in unfiltered samples from this well ranged from 2,800 to 4,820 µg/L

Acronyms/Abbreviations:
- COC – chemical of concern
- DCB – dichlorobenzene
- DCA – dichloroethane
- DCE – dichloroethene
- µg/L – micrograms per liter
- STD – standard deviation
- TCE – trichloroethene
- VOC – volatile organic compound

If data evaluation indicates that COCs are reported in groundwater samples at concentrations exceeding their respective trigger or warning levels, additional groundwater samples including original and laboratory split samples will be collected from the monitoring wells and analyzed. The laboratory split samples will be submitted to different laboratories for analysis to determine whether the significant difference was a result of laboratory error.

If the analytical data from the additional groundwater samples indicate or confirm concentrations of any COCs above respective trigger or warning levels, the DON will:

- take all immediate steps necessary to protect public health and safety and the environment;
- verify the analytical results and conduct remonitoring as necessary;
- notify the RWQCB and other regulatory agencies in writing within 30 working days of learning the trigger levels have been exceeded, indicating what has been done or is planned to be done to resolve the problem; and
- submit to the RWQCB and other regulatory agencies, within 90 days of the date of receipt of such data, a program to assess the LTMP and the probable causes for the significant change in groundwater quality.

4.2 SURFACE WATER MONITORING

Surface water will be monitored at four locations in Peters Canyon Channel. The four surface water monitoring locations (1SW03, 1SW04, 1SW06, and 1SW07) are identified on Figure 3-1.

4.2.1 Surface Water Sampling

Surface water monitoring locations, sampling frequency, and the analytical schedule are presented in Table 4-1. Surface water monitoring will be performed quarterly for the first year. These data will be used to assess whether the remedy is "operating properly and successfully." The frequency of monitoring is subject to review and modification, based on evaluation of ongoing results. Annual reviews and 5-year detailed reviews are the mechanisms for recommending modifications to the surface water monitoring program, as discussed in Section 4.4 of this OMP.

Surface water monitoring will be scheduled to coincide with groundwater monitoring, when possible. If there is insufficient surface water in Peters Canyon Channel for sample collection during a groundwater monitoring event, then the absence of sufficient surface water will be documented in the field logbook, and surface water samples will not be collected.

Surface water sampling will be conducted in accordance with methods and procedures described in the FSP (Attachment A). During each monitoring event, water levels at each sampling location will be measured prior to sample collection. Surface water samples will be analyzed for VOCs using U.S. EPA Method 8260B. In addition, general water-quality parameters including pH, temperature, conductivity, dissolved oxygen, and oxidation-reduction potential will be monitored using a field instrument, and will be recorded for each sampling location.

Analytical methods, target detection limits, and project-specific remediation goals for COCs identified in groundwater at the site are summarized in Table 4-3.

4.2.2 Data Evaluation

Surface water data will be evaluated by comparing analytical results from surface water samples to water level data and water quality data from groundwater monitoring wells and to site-specific action levels established for the site (Table 4-3). The goal of the data evaluation is to determine whether COCs in groundwater are migrating beyond site boundaries into the surface water in Peters Canyon Channel.

If the comparisons indicate COCs are migrating beyond site boundaries, additional surface water samples including original and laboratory split samples will be collected and analyzed. The laboratory split samples will be submitted for analysis to determine whether the significant difference was a result of laboratory error.

If the analytical data from the additional surface water samples indicate or confirm concentrations of any COCs above respective remediation goals, the DON will:

- take all immediate steps necessary to protect public health and safety and the environment;
- verbally notify the RWQCB and other regulatory agencies within 24 hours;
- notify the RWQCB and other regulatory agencies in writing within 30 working days of learning the respective remediation goals have been exceeded, indicating what has been done or is planned to be done to resolve the problem; and
- submit to the RWQCB and other regulatory agencies, within 90 days of the date of receipt of such data, a program to assess the LTMP and the probable causes for the significant change in surface water quality.

4.3 LANDFILL GAS MONITORING

A total of three LFG monitoring probes are included in the LFG monitoring network. The three LFG probes (I001LFG,1S, I001LFG,2S, and I001LFG,3S) are located west of and adjacent to the landfill area associated with the historical disposal trenches and crash crew burn pits (Figure 3-1). The locations of the LFG probes were chosen based on the objective of evaluating whether LFG is migrating off-site to the west. Peters Canyon Channel and the concrete groundwater containment wall are interpreted to prevent LFG migration to the east. Similarly, the Santa Ana/Santa Fe Channel is interpreted to prevent migration of LFG to the north.

4.3.1 Landfill Gas Sampling

Currently, the DON has an exemption from LFG monitoring from the CIWMB. However, LFG monitoring as described in this section was included for completeness in the event that LFG monitoring is required in the future.

The three LFG monitoring probes were installed at a total depth of approximately 7.5 feet bgs, with the screened interval in each of the probes at approximately 5.0 to 7.5 feet bgs. Construction details for the LFG probes are presented in the draft final Work Plan, Potential Landfill Gas Migration Evaluation (BNI 1999b).

LFG monitoring will be conducted in accordance with the methods and procedures presented in the FSP (Attachment A). Analytical methods, target detection limits, and project-specific remediation goals for LFG are summarized in Table 4-5. During each LFG monitoring event (if required in the future), the three LFG probes will be monitored, using an organic vapor analyzer (OVA), for the potential presence of LFG. Prior to monitoring, the probes will be tested for negative pressure. Probes that are under negative pressure are considered inadequate for monitoring.

The following LFG monitoring results will be documented:

- indication of probe pressure (negative or positive)
- level of groundwater in the probe to determine whether the screened interval remains above the water in the well
- the concentration of total VOCs measured at each probe
- the date, time, general weather conditions, and probe pressures
- names of sampling personnel, apparatus used, and a brief description of the methods used

4.3.2 Data Evaluation

If field monitoring with the OVA indicates total VOC concentrations in LFG below 500 parts per million (ppm), then no further action for that monitoring event will be required. If field monitoring with the OVA detects total VOCs in LFG at concentrations exceeding 500 ppm, then soil gas samples will be collected and analyzed for total VOCs using method TO-14 and for methane using American Society for Testing and Materials Method D1945.

If the results of soil gas monitoring indicate concentrations of total VOCs or methane gas in excess of the compliance levels listed in Table 4-5, the DON will:

- take all immediate steps necessary to protect public health and safety and the environment;
- notify the RWQCB and CIWMB in writing within 5 working days of learning the compliance levels have been exceeded, indicating what has been done or is planned to be done to resolve the problem;
- verify the results by reviewing the probe readings and instrumentation accuracy, and by remonitoring as necessary;
- submit to the RWQCB and CIWMB within 10 days a letter describing the nature and extent of the problem and any immediate corrective actions that need to be taken to protect public health and safety and the environment; and
- construct a gas control system, if required pursuant to 14 CCR 17783.15(5).

Table 4-5
Analytical Methods, Target Method Detection Limits, and Site-Specific Action Levels for Landfill Gas

Analyte	Analytical Method	Target Method Detection Limit	Site-Specific Action Levels	Basis
Total VOCs	OVA	5–10 ppm_v	500 ppm_v	AQOs
Total VOCs	TO-14	2–8 ppb_v	—*	—
Methane	ASTM D1945	5 ppb_v	Must not exceed 1.25 percent of the volume in air within on-site structures, and must not exceed 5 percent by volume in air at the site property boundary	Title 27 CCR 20921(a)(1), (2), and (3)

Note:
* dash indicates not established

Acronyms/Abbreviations:
AQO – air quality objective
ASTM – American Society for Testing and Materials
CCR – *California Code of Regulations*
OVA – organic vapor analyzer
ppb_v – parts per billion by volume
ppm_v – parts per million by volume
TBD – to be determined
VOC – volatile organic compound

4.4 FREQUENCY OF MONITORING

Groundwater and surface water monitoring events will be performed quarterly for the first year in accordance with the schedule presented in Table 4-1. If the results from the first year monitoring show the remedy is being effective and protective of human health and the environment, the U.S. EPA Administrator will determine if the remedy is "operating properly and successfully," (in accordance with CERCLA Section 120[h][3]) it will be recommended after achieving "operating properly and successfully" that monitoring continue on a semiannual basis until the end of the fifth year.

As part of CERCLA, 5-year reviews will be conducted to verify the continued successful performance of the remedy, including assuring that institutional controls remain in place. As part of the 5-year review process, the LTMP will be reviewed and amended or revised, if appropriate. If at any time monitoring data indicate that the remedy is not effective, then appropriate regulatory agencies will be notified, and appropriate corrective measures will be implemented. These corrective measures may include an increased frequency of inspections and monitoring events, and/or additional mitigation measures implemented to protect human health and the environment.

4.5 REPORTING REQUIREMENTS

The DON will be responsible for preparing quarterly LTM data submittals and annual LTM reports. The monitoring submittals and reports will be submitted to the DTSC, U.S. EPA, and RWQCB within 60 days of the end of each monitoring period.

Quarterly LTM data submittals will include groundwater, surface water, and (if required) LFG monitoring data and an evaluation and discussion of those data including but not limited to:

- an introduction to the report;
- a description of the field activities and laboratory analyses conducted;
- a summary discussion of the monitoring results;
- references cited;
- water-level contour maps for each WBZ monitored at the site;
- summary tables of historical water-level data and field parameter data;
- a laboratory analytical schedule for the current monitoring event;
- groundwater, surface water, and LFG analytical results; and
- quality control analytical results.

Annual LTM reports and 5-year detailed review reports will, in addition to the above-listed elements for quarterly data submittals, include:

- an executive summary;
- an introduction including an overview of the site history, regulatory framework, site investigation history, physical setting, hydrogeology, nature and extent of groundwater contamination, a description of the remedial measure, and report organization;
- a description of the groundwater, surface water, and LFG monitoring programs including their history, modifications, field measurements, and sampling and analyses;
- data evaluation including discussions of horizontal and vertical groundwater flow patterns and vertical groundwater gradients;
- groundwater and surface water quality evaluations including:
  - baseline concentrations and trigger levels for groundwater,
  - plume configurations and organic COC concentrations,
  - inorganic analyte distributions,
  - water chemistry, and
  - field parameters;

- a discussion of the effectiveness of the remedial measures; and
- conclusions and recommendations.

Results from LTM events will be used to demonstrate that the remedy is "operating properly and successfully," and to recommend future modifications to the LTMP. If prior to the property being transferred, LTM results indicate that the remedy is ineffective, the DON will verbally notify the DTSC, U.S. EPA, and RWQCB within 5 days and will provide written notification within 2 weeks of receipt of the data. If after the property is transferred, LTM results indicate that the remedy is ineffective, the DON or other transferee will verbally notify the DTSC, U.S. EPA, and RWQCB within 5 days and will provide written notification within 2 weeks of receipt of the data. Annual and detailed 5-year reviews are the mechanisms for determining whether the frequency of monitoring may be decreased or eliminated.

Section 5
CONTINGENCY PLAN

This section presents the Contingency Plan for OU-3, which is intended to identify appropriate contact personnel and their responsibilities in the event that an emergency response is required at the site. Contact information summarized on Table 5-1 will be updated, as necessary, prior to implementation of this OMP. This Contingency Plan also summarizes applicable elements of the ERP for the site and addresses instances when the ERP should be referenced. The ERP for the site is presented in the SSHP (Appendix E).

If an emergency response is required at the site, the ERO for OU-3 will be notified. The ERO will make a determination that an emergency has occurred and will ensure that appropriate corrective actions are implemented, as summarized in the sections below and discussed in the ERP. Further details of the ERO's responsibilities are described in the ERP. All inspectors, maintenance crews, visitors, and other personnel who enter the site are subject to the provisions of the ERP; therefore, they must read and be familiar with its provisions.

5.1 VANDALISM

Vandalism is defined as the willful or malicious destruction or defacement of public or private property. If it is evident (either by inspection or by notification) that vandalism has occurred at OU-3, then the ERO should be notified so that the following corrective measures may be performed.

1. The ERO will inspect and evaluate any damage or loss and will notify the DON of the extent of damages sustained at the site.
2. As necessary, the ERO will:
   - section off any area that may pose a safety hazard, and
   - take appropriate corrective action.

5.2 FIRE AND EXPLOSION

Fire or explosions that may affect the site may be caused by ignition of brush or, in extreme circumstances, by LFG accumulation in excess of the lower explosive limit. If it is determined (either by inspection or by notification) that a fire or explosion has occurred at the site, then the ERO shall be notified so that the following corrective measures may be performed.

1. Immediately report any occurrences of fire or explosion to both the ERO and the local fire department regardless of on-site capabilities.

   Fire Department: Dial 911
2. If appropriate, use a hand-operated fire extinguisher for grass fires.

Table 5-1
Contingency Plan Contact Information[a]

Contact	Full Name	Address	Contact Person
ERO[b]	Emergency Response Officer	DON Southwest Division 1220 Pacific Highway San Diego, CA 92132-5190	Jerry Dunaway (619) 532-0975
City of Tustin	City of Tustin	City of Tustin Community Development Department 300 Centennial Way Tustin, CA 92780	Dana Ogdon (714) 573-3116
DON	United States Department of the Navy	DON Southwest Division 1220 Pacific Highway San Diego, CA 92132-5190	Content Arnold (619) 532-0790
DTSC	California Environmental Protection Agency, Department of Toxic Substances Control	DTSC Office of Military Facilities 5796 Corporate Avenue Cypress, CA 90630	Jennifer Rich (714) 484-5415 Anantaramam Peddada (714) 484-5418
RWQCB	Regional Water Quality Control Board, Santa Ana Region	RWQCB California Tower 3737 Main Street, Suite 500 Riverside, CA 92501-3339	Patricia Hannon (909) 782-4498
CIWMB	California Integrated Waste Management Board	CIWMB 8800 Cal Center Drive Sacramento, CA 95826-3200	Michael Wochnick (916) 225-1302
OCPFRD	Orange County Public Facilities and Resources Department	PFRD County of Orange 300 North Flower Street, 8th Floor Santa Ana, CA 92703	Polin Modanlou (714) 834-2742
OCHCA-EH	Orange County Health Care Agency–Environmental Health	OCHCA-EH 2009 E. Edinger Avenue Santa Ana, CA 92705-4710	Patricia Henshaw (714) 667-2014
U.S. EPA	United States Environmental Protection Agency	U.S. EPA 75 Hawthorne Street (SFD-H-8) San Francisco, CA 94105-3901	James Ricks (415) 744-3023

Notes:
[a] contact information presented in this table will be updated, as necessary, prior to implementation of this Operation and Maintenance Plan, and in the event the property is transferred between entities; the U.S. EPA is included in this table as a contingency plan contact until the remedy is determined to be "operating properly and successfully"
[b] regulatory agencies will be notified in writing whenever there is a change in the person assigned as the Emergency Response Officer

(table continues)

Table 5-1 (continued)

Acronyms/Abbreviations:
CIWMB – California Integrated Waste Management Board
DON – Department of the Navy
DTSC – (Cal/EPA) Department of Toxic Substances Control
ERO – Emergency Response Officer
OCHCA-EH – Orange County Health Care Agency–Environmental Health
OCPFRD – Orange County Public Facilities and Resources Department
PRFD – Public Facilities and Resources Department
RWQCB – (California) Regional Water Quality Control Board
U.S. EPA – United States Environmental Protection Agency

An inspection and evaluation of the damage sustained by the cover will be performed when it has been determined that the fire is no longer a threat (at least 12 hours after extinguishing the fire). The ERO will notify the DON, DTSC, CIWMB, RWQCB, the city of Tustin, and other regulatory agencies of the damages sustained at the site. The ERO, in consultation with and with approval from the DON, DTSC, and RWQCB, will make arrangements to hire a contractor to reconstruct and/or repair the damaged landfill final cover as necessary. If reconstruction is to be performed, the cover shall be reconstructed in accordance with the plans and specifications used to design the construction of the original cover.

Upon completion of any repair or reconstruction work at the site, the ERO will notify the DON, DTSC, CIWMB, and RWQCB so that a site inspection may be conducted prior to obtaining final approval.

5.3 EARTHQUAKES

Earthquakes can cause slope failures and damage to drainage structures. Damage that threatens the integrity of the waste cover system or containment wall must be considered for immediate emergency repairs. Minor loss of soil cover, minor soil creep, limited and local settling, or other damage can be repaired on a nonemergency basis in the course of normal site maintenance.

In the event an earthquake occurs that has the potential for directly or indirectly causing slope failures and drainage system damage, the following corrective measures may be performed.

1. Following the earthquake, the ERO will inspect and make an evaluation of damages sustained.
2. The ERO, will decide whether damage to the cover system, surface drainage systems, or containment wall needs to be repaired immediately using contracted personnel and equipment.
3. The ERO will notify the DON, city of Tustin, DTSC, OCHCA-EH, and RWQCB of damages sustained at the site.
4. The ERO, in consultation with and approval from the DON, DTSC, and RWQCB, will make arrangements to hire a contractor to repair or reconstruct

the landfill cover and/or containment wall, as necessary. If reconstruction is to be performed, the cover and/or containment wall will be reconstructed in accordance with the plans and specifications used during the construction of the original structure. Upon completion of any repair or reconstruction work at the site, the ERO will notify the DON, DTSC, and RWQCB so that a site inspection may be conducted prior to obtaining final approval.

5.4 FLOODS

Flooding or washouts of the containment wall, berms, riprap, and drainage ditches or excessive damage to the landfill cover could occur as a result of an extreme weather event. Because of the potential for severe and forceful stormwater flow through the Peters Canyon Channel, the east side of the landfill (containment wall) is the most susceptible to flooding, inundation, and washout. Floods that result in the containment wall being breached by flood waters will require an evaluation of damage. Repairs of damage will be arranged by the ERO. In the event of a flood, the following corrective measures will be performed.

1. Following the flooding event, the ERO will inspect and make an evaluation of damage sustained.
2. The ERO will decide whether damage to the cover system and/or containment wall needs to be repaired immediately using contracted personnel and equipment (e.g., temporary diversion channels may be constructed, or sandbags may be used in conjunction with diversion channels to avoid infiltration of floodwater into the landfill).
3. The ERO will notify the DON, DTSC, the city of Tustin, Orange County Flood Control District, and RWQCB of the extent of damages sustained at the site.
4. As necessary, the ERO, in consultation with and with approval from the DON, DTSC, RWQCB, and the CIWMB, will make arrangements to hire a contractor to reconstruct the landfill cover and/or containment wall as necessary. If reconstruction is to be performed, the cover and/or containment wall shall be reconstructed in accordance with the plans and specifications used during the construction of the original structure. Upon completion of any repair or reconstruction work at the site, the ERO will notify the DON, DTSC, and RWQCB so that a site inspection may be conducted prior to obtaining final approval.

5.5 FAILURE OR COLLAPSE OF CONTAINMENT WALL

Failure or collapse of the containment wall, a steel-reinforced concrete structure, is considered to be unlikely except under extreme circumstances. In the unlikely event that the containment wall fails or collapses, the ERO will be notified and shall perform the following corrective measures.

1. The ERO will inspect and make an evaluation of damages sustained by the containment wall.

2. The ERO will decide whether damage to the containment wall needs to be repaired immediately using contracted personnel and equipment (e.g., temporary berming may be used to contain any soil or groundwater that breaches the containment wall).

3. The ERO will notify the DON, DTSC, RWQCB, Orange County Public Facilities and Resources Department, OCHCA-EH, the city of Tustin, and CIWMB of the damages sustained at the site, and of any emergency repairs being implemented or considered at the site.

4. As necessary, the ERO, in consultation with and with approval from the DON, DTSC, RWQCB, and CIWMB, will make arrangements to hire a contractor to repair or reconstruct the containment wall, as necessary. If reconstruction is to be performed, the containment wall shall be reconstructed in accordance with the plans and specifications used during the construction of the original structure. Upon completion of any repair or reconstruction work at the site, the ERO will notify the DON, DTSC, RWQCB, and CIWMB so that a site inspection may be conducted before obtaining final approval.

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Section 6
REFERENCES

Bechtel Environmental, Inc. 2003. Final Remedial Implementation Plan, Operable Unit 3, Marine Corps Air Station Tustin, Orange County, California. May.

Bechtel National, Inc. 1996a. Draft Remedial Investigation Report for Operable Unit 3. Prepared for Southwest Division Naval Facilities Engineering Command. July.

———. 1996b. Draft Feasibility Study Report for Operable Unit 3. Prepared for Southwest Division Naval Facilities Engineering Command. July.

———. 1997. Draft Final Interim Basewide Groundwater Monitoring Plan. Prepared for Southwest Division Naval Facilities Engineering Command. August.

———. 1998. Final 1997 Annual Groundwater Monitoring Report, Marine Corps Air Facility Tustin, California. Prepared for Southwest Division Naval Facilities Engineering Command. August.

———. 1999a. Final 1998 Annual Groundwater Monitoring Report. Prepared for Southwest Division Naval Facilities Engineering Command. December.

———. 1999b. Draft Final Work Plan, Potential Landfill Gas Migration Evaluation, Operable Unit 3, Marine Corps Air Station Tustin, California. Prepared for Southwest Division Naval Facilities Engineering Command. December.

———. 2000a. Final 1999 Annual Groundwater Monitoring Report, MCAF Tustin. Prepared for Southwest Division Naval Facilities Engineering Command. July.

———. 2000b. Quarterly Groundwater Monitoring Data Summary, March/April 2000, Marine Corps Air Facility Tustin, California. July.

———. 2000c. Quarterly Groundwater Monitoring Data Summary, Summer 2000, Marine Corps Air Facility Tustin, California. July.

———. 2001a. Annual Summary Report for Monthly Landfill Gas Monitoring, January Through December 2000, Operable Unit-3, Moffett Trenches and Crash Crew Burn Pits (Site 1), MCAS Tustin. Prepared for Southwest Division Naval Facilities Engineering Command. January.

———. 2001b. Quarterly Groundwater Monitoring Data Summary, Fall 2000, Marine Corps Air Facility Tustin, California. January.

———. 2001c. Final 2000 Annual Groundwater Monitoring Report, MCAS Tustin. Prepared for Southwest Division Naval Facilities Engineering Command. December.

———. 2001d. Quarterly Groundwater Monitoring Data Summary, Spring 2001, MCAS Tustin. Prepared for Southwest Division Naval Facilities Engineering Command. July.

———. 2001e. Quarterly Groundwater Monitoring Data Summary, Summer 2001, MCAS Tustin. Prepared for Southwest Division Naval Facilities Engineering Command. November.

———. 2001f. Addendum No. 3 to the Draft Final Interim Basewide Groundwater Monitoring Plan for Ongoing Monitoring, Marine Corps Air Station Tustin, California. March.

———. 2002a. Quarterly Groundwater Monitoring Data Summary, Fall 2001, MCAS Tustin. Prepared for Southwest Division Naval Facilities Engineering Command. February.

———. 2002b. Draft 2001 Annual Groundwater Monitoring Report, Marine Corps Air Station Tustin, California.

BEI. *See* Bechtel Environmental, Inc.

BNI. *See* Bechtel National, Inc.

Brown and Caldwell Consulting Engineers. 1985a. Confirmation Study, Site 1, Moffett Trenches and Crash Crew Pits, Marine Corps Air Station, Tustin, California, Volume II – Characterization Phase. NEESA 17-008. Prepared for Naval Energy and Environmental Support Activity. October, revised September 1986.

———. 1985b. Confirmation Study, Site 1, Moffett Trenches and Crash Crew Burn Pits, Marine Corps Air Station Tustin, California, Volume I – Verification Phase. NEESA 17-008. Prepared for Naval Energy and Environmental Support Activity. July, revised September 1986.

———. 1986. Predesign Study, Site 1, Moffett Trenches and Crash Crew Burn Pits, Marine Corps Air Station Tustin, California, Volume III – Additional Characterization of Burn Pit Contamination. NEESA 17-008. Prepared for Naval Energy and Environmental Support Activity. December.

Southwest Division Naval Facilities Engineering Command. 1996. Proposed Plan, Operable Unit 3, Moffett Trenches and Crash Crew Burn Pits Site, Marine Corps Air Facility, Tustin, California. October.

———. 2001. Final Record of Decision/Remedial Action Plan, Operable Unit 3, Moffett Trenches and Crash Crew Burn Pits Site, Marine Corps Air Station, Tustin, California. December.

———. 2003. Final Land-Use Control Implementation and Certification Plan, Operable Unit-3, Moffett Trenches and Crash Crew Burn Pits Site, Marine Corps Air Station Tustin, Orange County, California. May.

SWDIV. *See* Southwest Division Naval Facilities Engineering Command.

United States Environmental Protection Agency. 1996. Guidance for Evaluation of Federal Agency Demonstrations that Remedial Actions Are Operating Properly and Successfully Under CERCLA Section 120(h)(3).

———. 2000. Guidance for the Data Quality Objectives Process. EPA QA/G-4. August.

U.S. EPA. *See* United States Environmental Protection Agency.

ATTACHMENT A

FIELD SAMPLING PLAN

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway
San Diego, California 92132-5190

Contract No. N68711-95-D-7526

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

CLEAN 3

FINAL
FIELD SAMPLING PLAN
OPERATION AND MAINTENANCE PLAN
OPERABLE UNIT 3
MARINE CORPS AIR STATION TUSTIN
ORANGE COUNTY, CALIFORNIA

CTO-0045/0030
May 2003

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James T. Callian, CEG 2154, CTO Leader

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Nars Ancog, SWDIV Quality Assurance Officer

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ACRONYMS/ABBREVIATIONS

AQO	air quality objective
ASTM	American Society for Testing and Materials
BNI	Bechtel National, Inc.
CCR	*California Code of Regulations*
CEG	Certified Engineering Geologist
CFR	*Code of Federal Regulations*
CIWMB	California Integrated Waste Management Board
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	(U.S. EPA) Contract Laboratory Program
COC	chemical of concern
CTO	contract task order
DO	dissolved oxygen
DON	Department of the Navy
DQO	data quality objective
EC	electrical conductance
FS	feasibility study
FSP	field sampling plan
HCl	hydrochloric acid
IDW	investigation-derived waste
IDWMP	investigation-derived waste management plan
JEG	Jacobs Engineering Group Inc.
JP-5	jet propellant grade 5
LFG	landfill gas
LUCICP	land-use control implementation and certification plan
MCAS	Marine Corps Air Station
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
mL/min	milliliters per minute
OCHCA	Orange County Health Care Agency
OMP	operation and maintenance plan
ORP	oxidation-reduction potential

OU	operable unit
OVA	organic vapor analyzer
ppb_v	parts per billion by volume
ppm	parts per million
ppm_v	parts per million by volume
QAPP	quality assurance project plan
QC	quality control
RAP	remedial action plan
RI	remedial investigation
ROD	record of decision
SDWA	Safe Drinking Water Act
SOP	standard operating procedure
SWDIV	Southwest Division Naval Facilities Engineering Command
TAL	target analyte list
TPH	total petroleum hydrocarbons
U.S. EPA	United States Environmental Protection Agency
VOA	volatile organic analysis
VOC	volatile organic compound
WBZ	water-bearing zone

Section 1
OBJECTIVES

This Field Sampling Plan (FSP) provides site-specific guidance related to the activities associated with the Operation and Maintenance Plan (OMP) at Operable Unit (OU)-3, formerly Installation Restoration Program Site 1, Moffett Trenches and Crash Crew Burn Pits, Marine Corps Air Station (MCAS) Tustin, California. This plan was prepared in accordance with Contract Task Order (CTO)-0045, issued by the Southwest Division Naval Facilities Engineering Command (SWDIV), under the Comprehensive Long-Term Environmental Action Navy (CLEAN) 3 Program, Contract No. N68711-95-D-7526.

1.1 SITE LOCATION

OU-3 is located in Orange County, California, approximately 40 miles south of downtown Los Angeles and more than 100 miles north of the California/Mexico border (Figure 1-1). The site is in the eastern corner of MCAS Tustin, situated along the western bank of Peters Canyon Channel, approximately 700 feet northeast of Moffett Drive. The site is bounded on the east by Peters Canyon Channel, on the north by Edinger Avenue, on the south by Moffett Drive, and on the west by agricultural land (Figure 1-2).

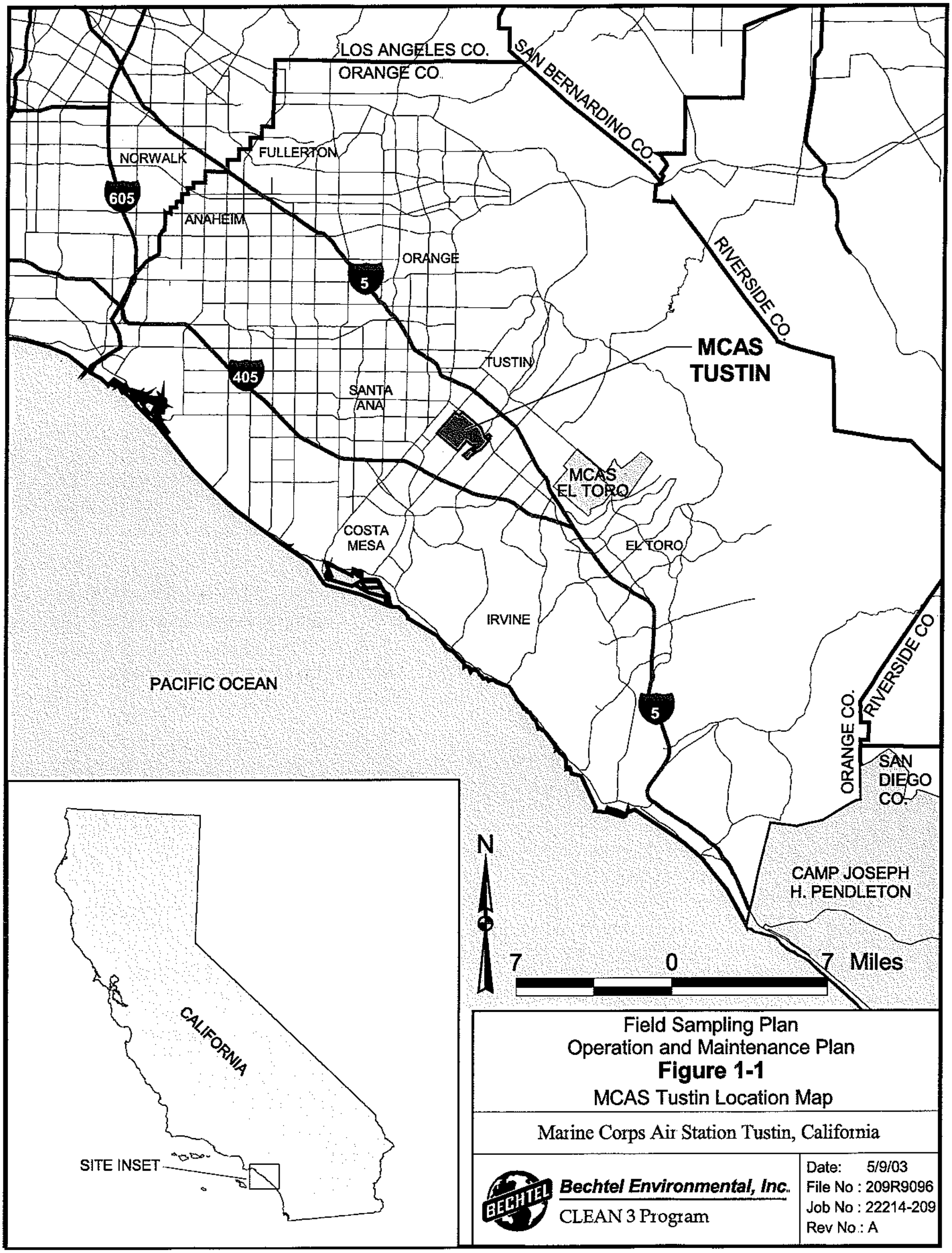
During the past 20 years, the area east of MCAS Tustin has changed from a predominantly agricultural area to a compact residential and industrial/manufacturing area, while land to the west has remained agricultural. Jamboree Road traverses the site from south to north, covering most of it. Based on a 1990 Orange County census (JEG 1993), approximately 260,000 people reside within a 4-mile radius of the base.

1.2 MONITORING OBJECTIVES

The objectives of this project are to assess and assure the continued effectiveness of the remedy, that it is "operating properly and successfully," and to provide data in support of proposed modifications to remedial activities conducted at the site, if necessary.

Data obtained during the long-term monitoring program as described in the OMP may be used by the Department of the Navy (DON) and/or regulatory agencies to evaluate whether the selected remedy initially is and will continue to be "operating properly and successfully" as described under Comprehensive Environmental Response, Compensation, and Liability Act Section 120(h)(3). The data obtained will enable the DON and/or regulatory agencies to verify and/or assure that maintenance and monitoring activities are being conducted in accordance with the OMP. The data may also be used to support and evaluate additional monitoring or mitigation measures that may be implemented in the event that the remedy fails.

Attachment F to this OMP is the Land-Use Control Implementation and Certification Plan (LUCICP) for OU-3. The LUCICP describes the land-use controls associated with the site, along with appropriate monitoring, inspection, reporting, and enforcement protocols needed to support land-use controls for the selected remedy outlined in the final Record of Decision (ROD)/Remedial Action Plan (RAP) (SWDIV 2001).

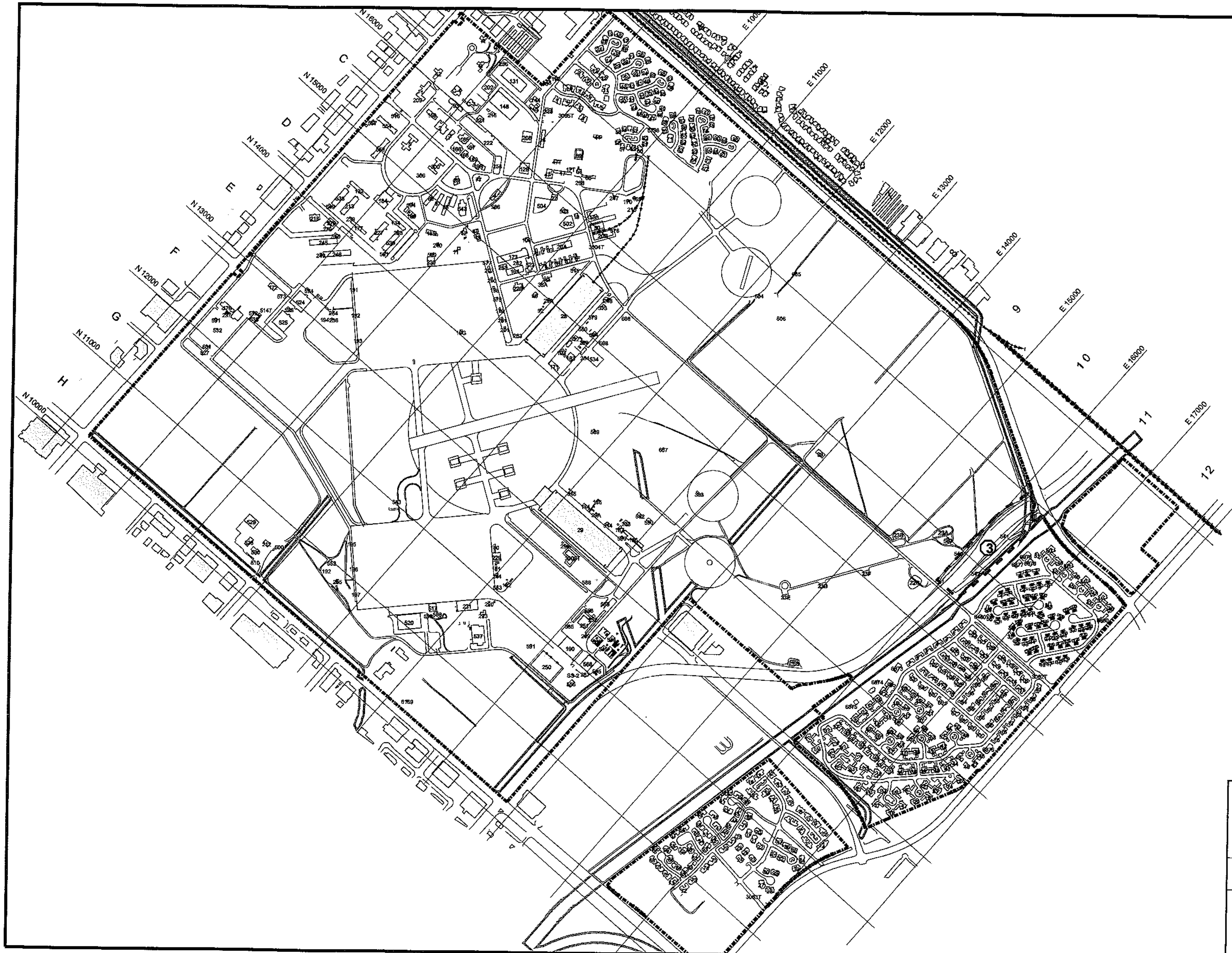


Field Sampling Plan
Operation and Maintenance Plan
Figure 1-1
MCAS Tustin Location Map

Marine Corps Air Station Tustin, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 5/9/03
File No : 209R9096
Job No : 22214-209
Rev No.: A



LEGEND

- (3) APPROXIMATE AREA OPERABLE UNIT 3
- GOVERNMENT PROPERTY LINE
- EXISTING ROAD OR PAVED AREA
- DRAINAGE DITCH
- BUILDING OR STRUCTURE
- RAILROAD

SOURCES:

BASE MAP BASED ON AERIAL SURVEY CONDUCTED BY AIRBORNE SYSTEMS, INC. ON OCTOBER 21, 1990. REVISED BY BECHTEL IN NOVEMBER 1997 TO UPDATE BASE MAP

N

1200 0 1200 Feet

Field Sampling Plan
Operation and Maintenance Plan
Figure 1-2
Site Location Map, Operable Unit 3

Marine Corps Air Station Tustin, California

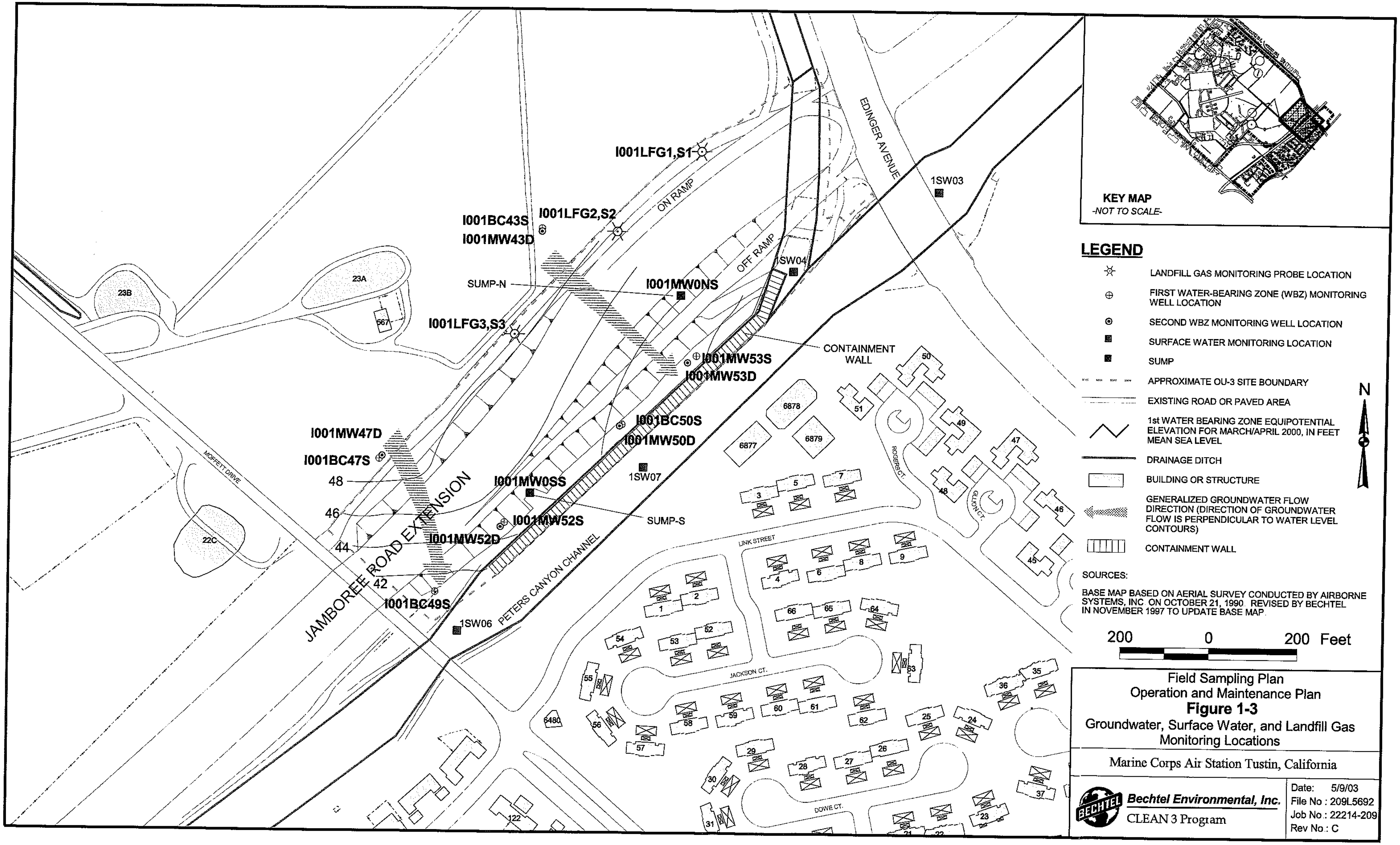
Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 5/9/03
File No : 209L9097
Job No : 22214-209
Rev No : A

In support of these objectives, this FSP:

- describes proposed sampling locations, rationale, logistics, and frequency;
- specifies chemicals of concern (COCs) and analytical laboratory methods;
- specifies physical parameters and analytical laboratory methods;
- describes types (media) of samples to be taken;
- describes the sampling strategy that will be used to satisfy data quality objectives (DQOs) (rationale for sampling locations, sample quantities, and analytical laboratory methods to be used);
- describes the field sampling procedures and sample-handling protocol that will be used to collect representative samples; and
- describes the quality assurance/quality control (QC) protocols necessary to provide a control on potential field or laboratory biases in the data.

Groundwater, landfill gas (LFG), and surface water monitoring locations are shown on Figure 1-3.



Field Sampling Plan
Operation and Maintenance Plan
Figure 1-3
Groundwater, Surface Water, and Landfill Gas Monitoring Locations

Marine Corps Air Station Tustin, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 5/9/03
File No : 209L5692
Job No : 22214-209
Rev No : C

Section 2
BACKGROUND

This section provides a history of the site. It includes activities that resulted in contamination, what is known about the nature and extent of contamination, and past investigations.

2.1 BASE HISTORY

MCAS Tustin encompasses about 1,600 acres within central Orange County, California (Figure 1-2). The station was first commissioned in 1942, during World War II, as a Navy lighter-than-air base and operated until 1949, at which time it was decommissioned from all activities. In 1951, the station was reactivated to support the Korean conflict. More than 200 structures and various facilities were developed over the years to support MCAS Tustin's mission. These structures include two timber-frame blimp hangars, a 3,000-foot-long runway, aircraft parking aprons, and numerous aircraft maintenance shops. Development occupies all of the property except for 530 acres that are leased for commercial farming. As part of the Navy realignment and consolidation effort, the station was closed in July 1999.

2.2 SITE DESCRIPTION

This section describes activities that have taken place at the site and the physical characteristics of the site.

2.2.1 Site Operations History

The OU-3 site formerly consisted of unlined, shallow landfill trenches and pits constructed to burn flammable liquids for firefighter training exercises. Outlines of the trenches and pits, as well as the area covered by the landfill trenches and burn pits, have been estimated from aerial photographs and historical information as approximately 600 by 250 feet and are shown on Figure 2-1. Other subsurface features at the site include a "fishbone-style" French drain system.

Subsequent to the remedial investigation (RI) of OU-3, extensive road construction activities have taken place at the site. Jamboree Road has been widened, and the newly constructed southbound on-ramp and northbound off-ramp cover most of the site. In the area of the road improvements, a high-density polyethylene liner was installed on top of the original ground surface. Figure 1-3 shows the area covered by the road improvements and the plastic liner. Approximately 20 feet of fill material was placed on the site to support the elevating and widening of Jamboree Road and construction of the elevated ramps. As a result, virtually the entire former waste-disposal trenches, pits, and landfill areas are now covered by Jamboree Road, the ramps, and associated embankment slopes. The road improvements also include a surface-water runoff collection system that collects and directs runoff to Peters Canyon Channel. Further site background information on OU-3 can be found in the final ROD/RAP (SWDIV 2001).

2.2.2 Geology and Hydrogeology

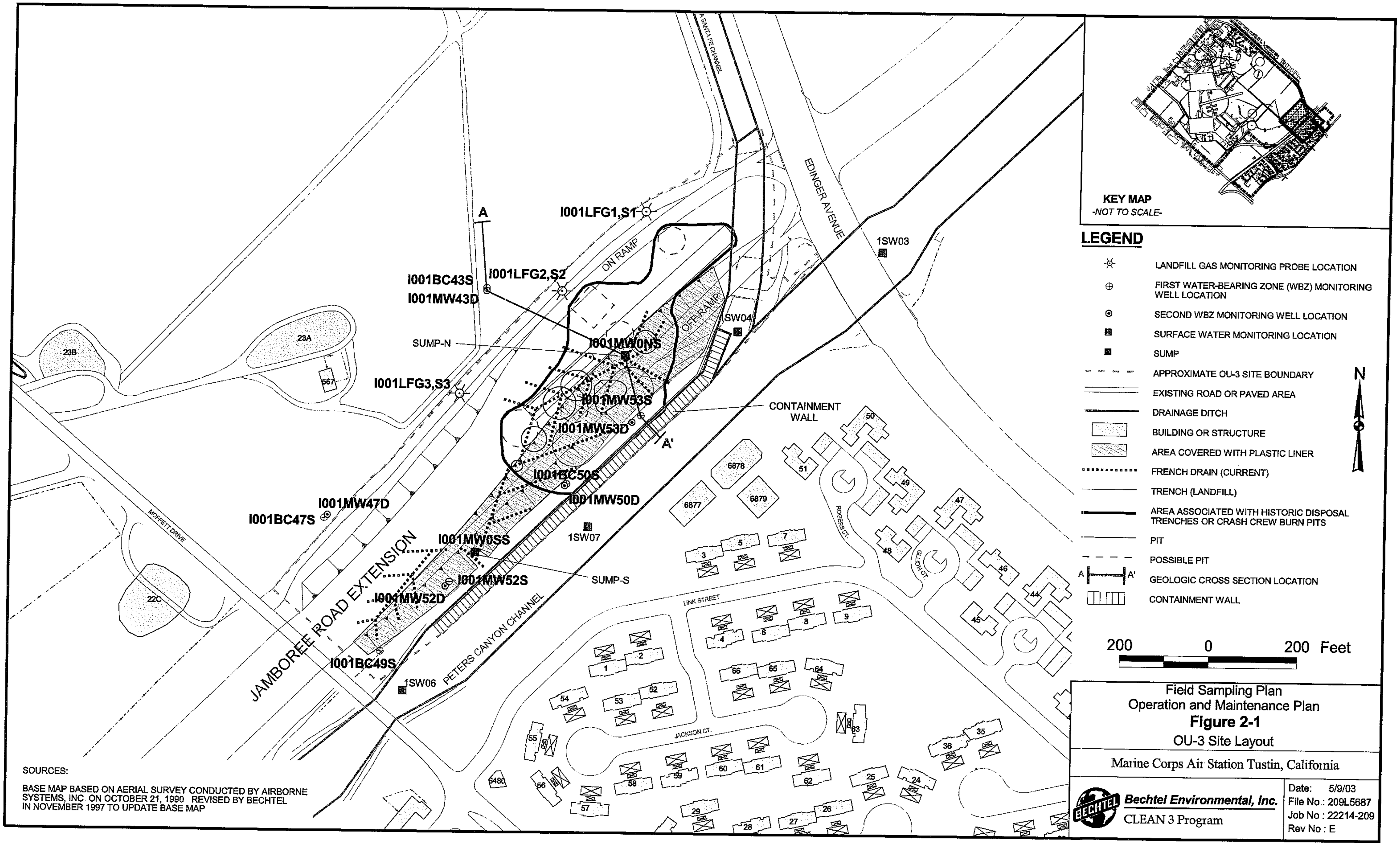
The upper 25 feet of native soils consists predominantly of fine-grained materials (primarily silts and clays of various plasticity). Pockets of coarser-grained materials (silty sands and sand) were encountered close to Peters Canyon Channel in the northern and central parts of the Moffett Trenches area; these pockets terminate to the west and south. Many of the coarser-grained materials (silty sand or sand) encountered within the upper 20 feet are artificial fill and landfill materials. Most of these sandy pockets are above the current water table and limited to the Moffett Trenches area.

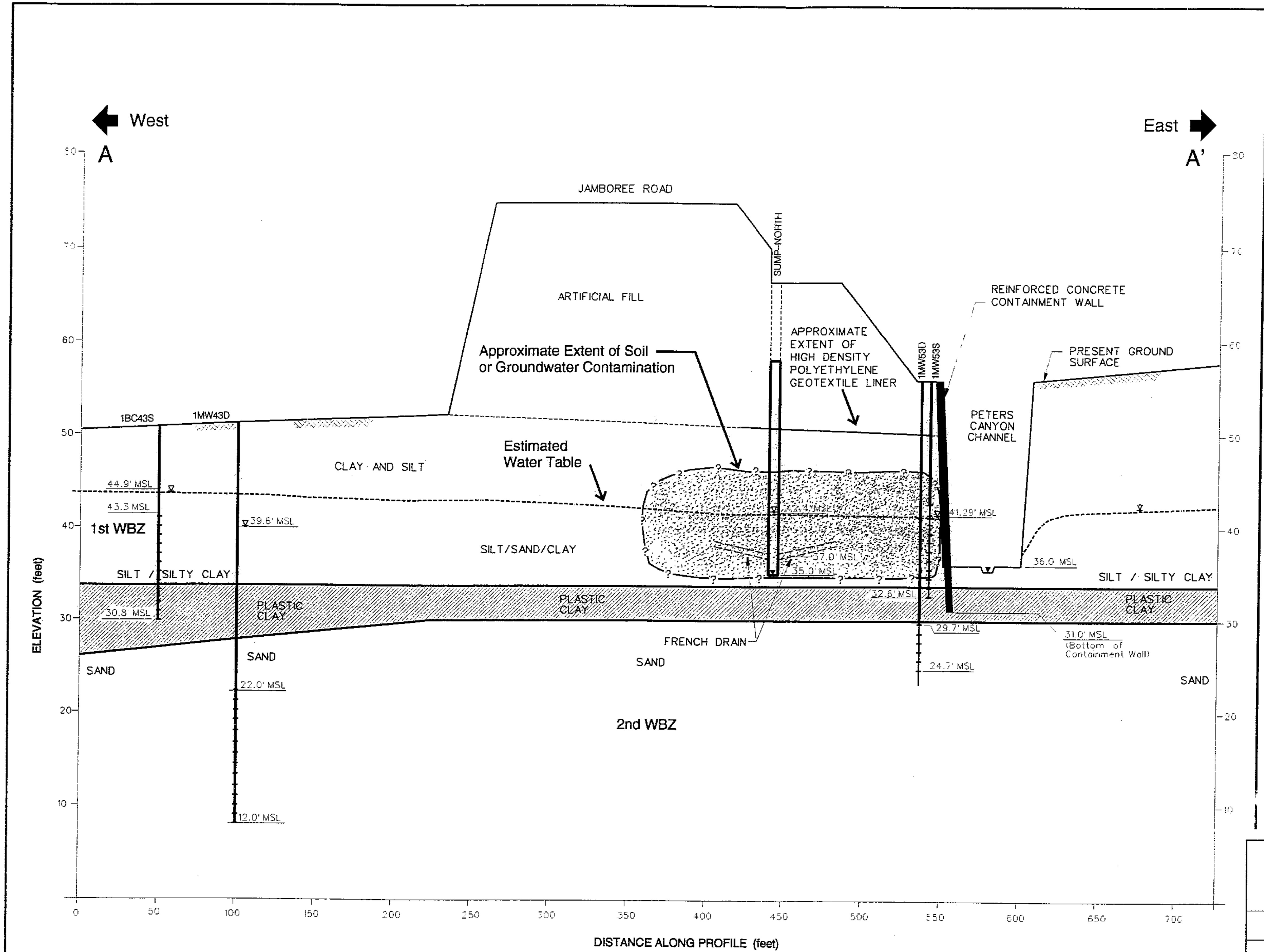
The water table beneath the site was located at approximately 10 to 15 feet below ground surface before construction of the Jamboree Road extension. Up to 20 feet of soil was added as fill to support construction at the site. The shallow aquifer system beneath the site consists of an uppermost, unconfined water-bearing zone (WBZ) and two underlying semiconfined WBZs, referred to as the first, second, and third WBZs, respectively. The first WBZ extends from the water table to approximately 20 to 25 feet below the original ground surface and is separated from the second WBZ by a locally continuous clay aquitard. The second and third WBZs occur from approximately 30 to 60 and 60 to 90 feet, respectively, below the original ground surface. The boundaries between the WBZs vary from location to location, reflecting the heterogeneity of the sediments within each depth range. A "regional aquifer" beneath the site is present approximately 90 to 95 feet below the original ground surface. The data evaluated in the RI indicate no evidence of hydraulic connection between the shallow and regional aquifers beneath the site.

Soil gas migration from OU-3 is possible to the west; however, Peters Canyon Channel and the OU-3 containment wall halt soil gas migration to the east. Previous subsurface investigations at OU-3 indicate that no natural preferential pathways are anticipated in the vicinity of OU-3. A cross section illustrating subsurface conditions, the location of Peters Canyon Channel, and any known utilities is presented on Figure 2-2.

2.3 PREVIOUS INVESTIGATIONS

Numerous site investigations have been conducted at OU-3. An overview of these investigations can be found in the ROD/RAP for OU-3, Moffett Trenches and Crash Crew Burn Pits Site (SWDIV 2001).


KEY MAP
-NOT TO SCALE-
LEGEND
LANDFILL GAS MONITORING PROBE LOCATION
FIRST WATER-BEARING ZONE (WBZ) MONITORING WELL LOCATION
SECOND WBZ MONITORING WELL LOCATION
SURFACE WATER MONITORING LOCATION
SUMP
APPROXIMATE OU-3 SITE BOUNDARY
EXISTING ROAD OR PAVED AREA
DRAINAGE DITCH
BUILDING OR STRUCTURE
AREA COVERED WITH PLASTIC LINER
FRENCH DRAIN (CURRENT)
TRENCH (LANDFILL)
AREA ASSOCIATED WITH HISTORIC DISPOSAL TRENCHES OR CRASH CREW BURN PITS
PIT
POSSIBLE PIT
GEOLOGIC CROSS SECTION LOCATION
CONTAINMENT WALL
N
200 0 200 Feet
A
A'
I001LFG1,S1
I001LFG2,S2
I001LFG3,S3
I001BC43S
I001MW43D
SUMP-N
I001MW0NS
I001MW53S
I001MW53D
I001BC50S
I001MW50D
I001MW47D
I001BC47S
I001MW0SS
I001MW52S
I001MW52D
I001BC49S
SUMP-S
CONTAINMENT WALL
1SW03
1SW04
1SW06
1SW07
ON RAMP
OFF RAMP
EDINGER AVENUE
JAMBOREE ROAD EXTENSION
PETERS CANYON CHANNEL
MOFFETT DRIVE
LINK STREET
JACKSON CT.
ROGERS CT.
23A
23B
22C
567
6877
6878
6879
6480
SOURCES:
BASE MAP BASED ON AERIAL SURVEY CONDUCTED BY AIRBORNE SYSTEMS, INC. ON OCTOBER 21, 1990 REVISED BY BECHTEL IN NOVEMBER 1997 TO UPDATE BASE MAP
Field Sampling Plan
Operation and Maintenance Plan
Figure 2-1
OU-3 Site Layout
Marine Corps Air Station Tustin, California
Bechtel Environmental, Inc.
CLEAN 3 Program
Date: 5/9/03
File No : 209L5687
Job No : 22214-209
Rev No : E



Field Sampling Plan
Operation and Maintenance Plan
Figure 2-2
Geologic Cross Section A-A'

Marine Corps Air Station Tustin, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 5/12/03
File No : 209X5702
Job No : 22214-209
Rev No : B

Section 3
MAPS

This section lists maps showing the site location, site boundaries, monitoring locations, and other relevant information.

- Figure 1-1, MCAS Tustin Location Map
- Figure 1-2, Site Location Map Operable Unit-3
- Figure 1-3, Groundwater, Surface Water, and Landfill Gas Monitoring Locations
- Figure 2-1, OU-3 Site Layout
- Figure 2-2, Geologic Cross Section A-A′

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Section 4
RATIONALE

This section presents the rationale for groundwater, surface water, and (if required) LFG monitoring to be conducted at OU-3, and is taken from the DQO section in the OMP. This section describes how this FSP will meet the stated objectives. Currently, the DON has an exemption from LFG monitoring from the California Integrated Waste Management Board (CIWMB). However, the methods and procedures for LFG monitoring are included in this section for completeness in the event LFG monitoring is required in the future.

The seven-step United States Environmental Protection Agency (U.S. EPA) DQO process will be used for site monitoring. The data collected will be used to assess potential risks to human health and the environment. The DQOs developed for site monitoring consist of qualitative and quantitative statements describing the required detection limit, degree of certainty, and laboratory QC level for each specified use.

Section 3 of Attachment B, the Quality Assurance Project Plan (QAPP), defines the quantitative DQOs. A detailed discussion of the qualitative DQOs is provided in Section 3 of the OMP. DQOs for groundwater, surface water, and LFG are summarized in Tables 4-1, 4-2, and 4-3, respectively.

The analytical testing schedule for groundwater, surface water, and LFG (if required) is presented in Table 4-4. The analytical methods, target method detection limits, and site-specific action levels for groundwater and surface water are included in Table 4-5. The analytical methods, target method detection limits, and site-specific action levels for LFG are included in Table 4-6.

Table 4-1
Data Quality Objectives for Long-Term Groundwater Monitoring

Step	Process	Response
1	State the problem.	Based on the RI/FS performed for OU-3, the selected remedial alternative is containment with institutional controls, including groundwater monitoring. The primary groundwater monitoring objective is to demonstrate through monitoring that beneficial uses, human health, and the environment are protected and that the final remedy remains effective in preventing off-site contaminant migration.
2	Identify decisions that address the problem.	• Does groundwater monitoring indicate that off-site contaminant migration at levels exceeding action levels is occurring? • Does groundwater monitoring indicate that the remedy is effective?
3	Identify inputs that affect the decision	Inputs that affect the decision are: • a monitoring network in the critical migration path(s) and at background locations, • water levels from the monitoring wells, • concentrations of site-specific analytes (including chlorinated VOCs, benzene, JP-5, and a few TAL metals) from the monitoring wells, • action levels for groundwater (MCLs, MCLGs, water quality objectives, background levels), and • statistical evaluation of the analytical data (including evaluation of trigger levels).
4	Define the study boundaries.	The horizontal study boundary is the OU-3 property boundary, which will be surveyed by a licensed surveyor and will be provided in the LUCICP before implementing the OMP. The vertical study boundary includes the first and second WBZ (from ground surface to approximately 60 feet below ground surface). The temporal boundary is continued groundwater monitoring until site conditions no longer warrant, as defined during remedial design.
5	Identify decision rules.	• If groundwater monitoring indicates that off-site contaminant migration at concentrations exceeding action levels is occurring, then additional or increased frequency monitoring will be conducted and/or remedial measures will be implemented to prevent off-site contaminant migration. The course of action is defined in the OMP. • If groundwater monitoring indicates that off-site contaminant migration at concentrations exceeding action levels is not occurring, and that the remedy is effective, then further monitoring will be employed to assure the continued effectiveness of the remedy. Modifications to the monitoring frequency may be made based on the results of the annual reports and 5-year detailed reviews.
6	Specify the limits on uncertainty.	A judgmental sampling approach will be used. Therefore, limits on decision errors are not quantifiable. The most severe error would be to conclude that action is not required when, in reality, a threat of migration of groundwater with COCs above action levels exists. The judgmental sampling approach has been designed to minimize the probability of committing this error.

(table continues)

Table 4-1 (continued)

Step	Process	Response
7	Optimize the design.	Water levels will be measured at all OU-3 monitoring wells and groundwater samples will be collected in accordance with the schedule presented in Table 4-4. Samples will be collected from downgradient guard wells and from in-plume and crossgradient wells for VOC analysis using U.S. EPA Method 8260B. Samples will be collected from affected wells for TPH-fuel, TAL metals, and water-chemistry-parameter analysis using U.S. EPA Methods 8015-M, 6000/7000 series, 160.1, 300.0, and 310.0. The sampling design will be evaluated annually and updated as needed. The annual monitoring report and the 5-year review are the mechanisms for future recommendations.

Acronyms/Abbreviations:
COC – chemical of concern
FS – feasibility study
JP-5 – jet propellant grade 5
LUCICP – land-use control implementation and certification plan
MCL – maximum contaminant level
MCLG – maximum contaminant level goal
OMP – operation and maintenance plan
OU – operable unit
RI – remedial investigation
TAL – target analyte list
TPH – total petroleum hydrocarbons
U.S. EPA – United States Environmental Protection Agency
VOC – volatile organic compound
WBZ – water-bearing zone

Table 4-2
Data Quality Objectives for Long-Term Surface Water Monitoring

Step	Process	Response
1	State the problem.	Based on the RI/FS performed for OU-3, the selected remedial alternative is containment with institutional controls, including monitoring. The primary surface water monitoring objective is to demonstrate through monitoring that beneficial uses, human health, and the environment are protected and that the final remedy is effective in preventing contaminant migration from the site.
2	Identify decisions that address the problem	• Does surface water monitoring indicate that groundwater with COCs above action levels is migrating into and adversely affecting the high-quality surface water in Peters Canyon Channel? • Does surface water monitoring indicate that the final remedy is effective?
3	Identify inputs that affect the decision.	Inputs that affect the decision are: • upgradient and downgradient monitoring locations in Peters Canyon Channel, • stream water levels from the surface water gauging locations in the Santa Ana-Santa Fe Channel and the Peters Canyon Channel, • concentrations of site-specific analytes (including chlorinated VOCs and benzene) from the gauging locations, • action levels for surface water (MCLs, MCLGs, water quality objectives, background levels), and • statistical evaluation of the analytical data.
4	Define the study boundaries.	The horizontal study boundary includes the four surface water monitoring locations in Peters Canyon Channel and Santa Ana-Santa Fe Channel. The vertical study boundary is the base of the Peters Canyon Channel and Santa Ana-Santa Fe Channel at the monitoring locations. The temporal boundary is continued surface water monitoring until site conditions no longer warrant, as defined during remedial design.
5	Identify decision rules.	• If surface water monitoring indicates that groundwater with COCs above action levels is migrating into and adversely affecting the high-quality surface water in Peters Canyon Channel, then perform additional monitoring and/or implement additional remedial action to prevent off-site contaminant migration. The course of action is defined in the OMP. • If surface water monitoring indicates that the remedy is effective and groundwater with COCs above action levels is not migrating into and adversely affecting the high-quality surface water in Peters Canyon Channel, then further monitoring will be employed to assure the continued effectiveness of the remedy. Modifications to the monitoring frequency may be made based on the results of the annual reports and 5-year detailed reviews
6	Specify the limits on uncertainty	A judgmental sampling approach will be used. Therefore, limits on decision errors are not quantifiable. The most severe error would be to conclude that action is not required when, in reality, a threat of migration of surface water with COCs above action levels exists. The judgmental sampling approach has been designed to minimize the probability of committing this error.

(table continues)

Table 4-2 (continued)

Step	Process	Response
7	Optimize the design.	Water levels will be measured at all OU-3 surface water gauging locations and surface water samples will be collected in accordance with the analytical schedule presented in Table 4-4. Samples will be collected from all surface water gauging locations for VOC analysis using U.S. EPA Method 8260B. The sampling design will be evaluated annually and updated as needed. The annual monitoring report and the 5-year review are the mechanisms for future recommendations.

Acronyms/Abbreviations:
COC – chemical of concern
FS – feasibility study
MCL – maximum contaminant level
MCLG – maximum contaminant level goal
OMP – operation and maintenance plan
OU – operable unit
RI – remedial investigation
U.S. EPA – United States Environmental Protection Agency
VOC – volatile organic compound

Table 4-3
Data Quality Objectives for Long-Term Landfill Gas Monitoring

Step	Process	Response
1	State the problem.	LFG from OU-3 may pose a potential threat to buildings (and future residents) proposed for construction west of the site.
2	Identify decisions that address the problem.	• Does LFG monitoring indicate that LFG is present at concentrations exceeding 500 ppm_v and is LFG migrating from OU-3?
3	Identify inputs that affect the decision.	Decision inputs include results from OVA LFG readings from the LFG monitoring probes and results from potential soil gas samples collected from the LFG probes.
4	Define the study boundaries.	The horizontal study boundary is the OU-3 property boundary, which will be surveyed by a licensed surveyor and will be provided in the LUCICP prior to implementing the OMP. The vertical study boundary includes the vadose zone within the OU-3 boundaries (from the ground surface to approximately 12 feet below ground surface). The temporal boundary is continued LFG monitoring until site conditions no longer warrant, as defined during remedial design.
5	Identify decision rules.	• If LFG monitoring indicates that LFG is present at concentrations above 500 ppm_v, then additional LFG samples will be collected and analyzed by an off-site laboratory for further evaluation to determine the potential for LFG migration beyond site boundaries. • If LFG monitoring indicates that LFG is not present at concentrations above 500 ppm_v, then no further action for that monitoring event will be required. • If monitoring has been conducted for four consecutive quarters after the remedy has been determined to be operating "properly and successfully," then a report with LFG data will be submitted by SWDIV to CIWMB and OCHCA, at which point the sampling frequency will be reevaluated, and may be reduced (i.e., quarterly to semiannually) with the goal of protecting public health and safety
6	Specify the limits on uncertainty.	A judgmental sampling approach will be used. Therefore, limits on decision errors are not quantifiable. The most severe error would be to conclude that action is not required when, in reality, a threat of LFG migration exists. The judgmental sampling approach has been designed to minimize the probability of committing this error.
7	Optimize the design	As no statistical sampling will be conducted, the design of the judgmental sampling approach will be evaluated annually and updated as needed. The annual monitoring reports and the 5-year reviews are the mechanisms for future recommendations

Acronyms/Abbreviations:
- CIWMB – California Integrated Waste Management Board
- LFG – landfill gas
- LUCICP – land-use control implementation and certification plan
- OCHCA -- Orange County Health Care Agency
- OMP – operation and maintenance plan
- OU – operable unit
- OVA – organic vapor analyzer
- ppm_v – parts per million by volume
- SWDIV – Southwest Division Naval Facilities Engineering Command

Table 4-4
Analytical Testing Schedule and Sampling Parameters

Station Identification	Monitoring Zone	Relative Location	QUARTER 1		QUARTER 2				QUARTER 3		QUARTER 4		
			VOCs[a]	TPH-Fuel[b]	VOCs	TAL Metals[c]	Water Chemistry[d]	TPH-Fuel	VOCs	TPH-Fuel	VOCs	TAL Metals	TPH-Fuel
Groundwater[e]													
I001BC43S	First WBZ	Background				X	X						
I001BC47S	First WBZ	Background				X	X						
I001BC49S	First WBZ	Downgradient			X	X	X				X	X	
I001BC50S	First WBZ	In plume			X	X	X	X			X	X	X
I001MW52S	First WBZ	In plume			X	X	X				X	X	
I001MW53S	First WBZ	In plume	X		X	X	X		X		X	X	
I001MW43D	Second WBZ	Background				X	X						
I001MW47D	Second WBZ	Background				X	X						
I001MW50D	Second WBZ	In plume			X	X	X	X			X		X
I001MW52D	Second WBZ	Downgradient			X	X	X						
I001MW53D	Second WBZ	In plume			X	X	X				X		
Surface Water													
1SW03	First WBZ	Upstream	X		X				X		X		
1SW04	First WBZ	Adjacent	X		X				X		X		
1SW06	First WBZ	Downstream	X		X				X		X		
1SW07	First WBZ	Adjacent	X		X				X		X		

Notes:
- [a] VOC analyses will be performed on groundwater and surface water samples using U.S. EPA Method 8260B (or equivalent), and (if required) on landfill gas samples using an organic vapor analyzer; if total VOCs in individual landfill gas samples exceed 500 parts per million, then soil gas samples will be collected and analyzed for total VOCs using U.S. EPA Method TO-14, and for methane using ASTM D1945
- [b] TPH-fuel analyses will be performed using U.S. EPA Method 8015-M
- [c] TAL metals analyses will be performed using U.S. EPA Method 6000/7000 series
- [d] water chemistry analyses include common anions (chloride, nitrate, phosphate, and sulfate) analyzed using U.S. EPA Method 300.0, alkalinity using U.S. EPA Method 310.1, and total dissolved solids using U.S. EPA Method 160.1
- [e] the analytical schedule for groundwater monitoring was taken from Addendum No. 3 to the draft final Interim Basewide Groundwater Monitoring Plan (BNI 2001) with revisions approved by the Base Closure Team during a November 2001 meeting; these revisions are presented in the 2002 Sampling and Analysis Schedule in the 2001 draft Annual Groundwater Monitoring Report (BNI 2002)

Acronyms/Abbreviations:
- ASTM – American Society for Testing and Materials
- TAL – target analyte list
- TPH – total petroleum hydrocarbons
- U.S. EPA – United States Environmental Protection Agency
- VOC – volatile organic compound
- WBZ – water-bearing zone

Table 4-5
Analytical Methods, Target Method Detection Limits, and Site-Specific Action Levels for Groundwater and Surface Water
(limits and action levels reported in micrograms per liter)

Analyte	Analytical Method	Target Method Detection Limit	Site-Specific Action Levels	Basis
Volatile Organic Compounds				
Benzene[a]	U.S. EPA 8260B	0.5	1	California MCL[b]
Chlorobenzene	U.S. EPA 8260B	0.5	70	California MCL
1,2-Dichlorobenzene	U.S. EPA 8260B	0.5	600	SDWA MCL[c]
1,4-Dichlorobenzene	U.S. EPA 8260B	0.5	5	California MCL
1,1-Dichloroethane[a]	U.S. EPA 8260B	0.5	5	California MCL
1,1-Dichloroethene[a]	U.S. EPA 8260B	0.5	6	California MCL
Ethylbenzene[a]	U.S. EPA 8260B	0.5	700	SDWA MCL
Trichloroethene[a]	U.S. EPA 8260B	0.5	5	SDWA MCL
Vinyl chloride[a]	U.S. EPA 8260B	0.5	0.5	California MCL
Metals				
Antimony	U.S. EPA CLP	20	6	California MCL
Arsenic	U.S. EPA CLP	1	50	SDWA MCL
Cadmium	U.S. EPA CLP	4	5	SDWA MCL
Manganese	U.S. EPA CLP	2	2,630	Background[d]
Molybdenum	U.S. EPA CLP	0.03	917	Background[e]
Thallium	U.S. EPA CLP	1	4.1	Background[e]

Notes:
- [a] not a chemical of concern for the site; however, a remediation goal for this chemical was established in the ROD/RAP for OU-3
- [b] California MCLs are 22 CCR 64444 (organics) and 64431 (inorganics)
- [c] SDWA MCLs are 40 CFR 141.61 (organics) and 141.62 (inorganics)
- [d] action level based on background concentrations established during the remedial investigation for OU-1 and OU-2
- [e] action level based on background concentrations established at upgradient wells during the OU-3 remedial investigation

Acronyms/Abbreviations:
- CCR – *California Code of Regulations*
- CFR – *Code of Federal Regulations*
- CLP – (U.S. EPA) Contract Laboratory Program
- MCL – maximum contaminant level
- OU – operable unit
- RAP – remedial action plan
- ROD – record of decision
- SDWA – Safe Drinking Water Act
- U.S. EPA – United States Environmental Protection Agency

Table 4-6
Analytical Methods, Target Method Detection Limits, and Site-Specific Action Levels for Landfill Gas

Analyte	Analytical Method	Target Method Detection Limit	Site-Specific Action Levels	Basis
Total VOCs	OVA	5 – 10 ppm_v	500 ppm_v	AQOs
Total VOCs	TO-14	2 – 8 ppb_v	—*	—
Methane	ASTM D1945	5 ppb_v	Must not exceed 1.25 percent of the volume in air within on-site structures, and must not exceed 5 percent by volume in air at the site property boundary	Title 27 CCR 20921(a)(1), (2), and (3)

Note:
* dash indicates not established

Acronyms/Abbreviations:
AQO – air quality objective
ASTM – American Society for Testing and Materials
CCR – *California Code of Regulations*
OVA – organic vapor analyzer
ppb_v – parts per billion by volume
ppm_v – parts per million by volume
VOC – volatile organic compound

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Section 5
FIELD METHODS AND PROCEDURES

This section specifies standard operating procedures (SOPs) to be used and describes the methods and procedures to be followed during field monitoring activities. The SOPs and methods presented below are intended to assure that field measurements are consistent and reproducible. Sampling preservation, holding, and shipping procedures are also outlined in this section.

5.1 STANDARD OPERATING PROCEDURES

The following CLEAN Program SOPs or their equivalents are expected to be used during field monitoring activities (BNI 2003).

- SOP 6, Instrument Calibration and Use
- SOP 7, Water and Free Product Level Measurement in Wells
- SOP 8, Groundwater Sampling
- SOP 9, Sample Containers, Preservation, and Handling
- SOP 10, Sample Custody, Transfer, and Shipment
- SOP 11, Decontamination of Equipment
- SOP 12, Surface Water Sampling
- SOP 17, Logbook Protocols
- SOP 22, Investigation-Derived Waste Management

5.2 GROUNDWATER MONITORING AND SAMPLING

Groundwater samples will be collected from the selected monitoring wells in accordance with the procedures outlined in SOP 8. Figure 1-3 shows the locations of the monitoring wells selected for groundwater sampling. Prior to sampling, wells will be inspected for damage and evidence of tampering, gauged for depth to groundwater and total depth and any floating free-phase product, and purged in accordance with California Environmental Protection Agency Department of Toxic Substances Control guidelines and the groundwater sampling procedures outlined in SOP 8. Groundwater and product levels will be measured using an electronic water-level meter and a groundwater/product interface probe (if required), respectively. Groundwater monitoring instruments will be calibrated prior to use in accordance with SOP 6. Water and free-phase product measurements will be taken in accordance with SOP 7.

5.2.1 Low-flow Purging Using a Portable Pump

To assure that the groundwater samples to be collected are representative of formation water in the WBZ penetrated by the well, each well will be purged before sampling. The objective of low-flow purging is to remove water from the monitoring well screened interval at a rate that is comparable to the ambient groundwater flow rate in the WBZ, minimizing drawdown in the well. This limits the mixing of water within the screened interval with overlying stagnant water in the well casing. Low-flow purging allows collection of representative groundwater samples with minimal disturbance and low turbidity while substantially reducing the volume of water that requires subsequent treatment and disposal.

As specified in Section 5.2, an initial water-level measurement will be taken at each sampling location after inspection of the well. Air monitoring for organic vapors at the wellhead during initial inspection of each well is no longer required. The CLEAN Program Safety and Health Manager has determined that such monitoring is no longer necessary. Previous monitoring conducted at each location during CTO-0141 and -0170 activities did not identify organic vapors that could pose a potential health threat to field personnel conducting groundwater monitoring.

Low-flow purging will be performed using a 2-inch Grundfos® Redi-Flo2 variable-speed electric submersible pump. In preparation for purging, the pump and associated electrical wiring will be thoroughly decontaminated. Each well to be sampled using the submersible pump is equipped with dedicated, Teflon®-lined discharge tubing that is suspended in the well beneath the well cap during the periods between sampling events. The dedicated, Teflon-lined discharge tubing will be removed from the well and attached to the submersible pump. The pump will then be lowered into the well until the pump intake is at the midpoint of the screened interval. The pump and discharge tubing will then be secured to the wellhead, and the surface end of the discharge tubing will be attached to the intake port of a flow-through cell. The flow-through cell will be used to allow monitoring of field water-quality parameters during purging. A YSI Model 6000B or equivalent flow-through cell will be used for this purpose.

A pumping rate of between 100 and 500 milliliters per minute (mL/min) will be maintained during purging. The rate will be specific to each well and will be selected to assure that little or no drawdown or mixing of stagnant and formation water occurs. The purge rate should be selected to achieve drawdown in the well of 0.3 foot or less. However, if the minimal drawdown that can be achieved even at a minimum purge rate of 100 mL/min exceeds 0.3 foot but remains relatively stable, purging should continue until the field parameters have stabilized. If the formation recharge rate to the well is substantially lower than the minimum purging rate and the well would be essentially dewatered during purging with the submersible pump, purging will be conducted using a bailer instead, as described in Section 5.2.2.

Field water-quality parameters will be monitored, and the water level in the well will be measured at approximately 5-minute intervals once purging begins. All such measurements will be recorded in the field logbook. Field water-quality parameters to be monitored during purging include pH, water temperature, electrical conductance (EC), dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity. Purging will continue until measurements for pH are within 0.5 of the two previous measured values and measurements of temperature, EC, DO, ORP, and turbidity have stabilized within 10 percent of the two previously measured values for each parameter. Purging will be considered complete when the field parameters have stabilized and the total volume of purged water is greater than one pump system volume (internal volume of pump and discharge tubing).

5.2.2 Purging Using a Bailer

Very low-yield wells that are dewatered during purging and cannot be purged in accordance with the low-flow procedure outlined in the previous section will be purged using a disposable Teflon-lined bailer. At such locations, the wells will be initially bailed until the casings are dewatered. After allowing the well to recover overnight, it will be bailed a second time until the casing is again dewatered. Once the water level has recovered sufficiently, the required samples will be collected. At wells where such bailing is required, the volatile organic compound (VOC) samples will be collected first, followed by the samples for any other required analyses.

During each bailing episode, pH, temperature, EC, DO, ORP, and turbidity measurements will be collected and recorded in the field logbook. The disposable bailer and associated string will be discarded after each use. Under no circumstances will these items be reused, even for subsequent bailing episodes at the same well location.

5.3 LANDFILL GAS MONITORING AND SAMPLING

The DON currently has an exemption from LFG monitoring at OU-3 from the CIWMB. However, maintaining the operational condition of the LFG probes is still required by the OMP. If LFG monitoring is required in the future, it will initially be conducted using an organic vapor analyzer (OVA), and soil gas samples will be collected if field monitoring with the OVA measures LFG at concentrations above 500 parts per million (ppm). The following subsections outline the LFG probe monitoring and sampling procedures.

5.3.1 Landfill Gas Probe Monitoring

If required, the three LFG probes will initially be monitored with an OVA for potential LFG. According to CIWMB postclosure LFG monitoring procedures, each LFG probe will be inspected for structural integrity and suitability for monitoring prior to each LFG monitoring event. In addition, each probe will be monitored for negative pressure prior to starting monitoring activities. A simple method to check for negative pressure is to hold a sheet of paper just above the opening of the probe and see whether the paper is sucked toward the opening. Probes that are damaged or are under negative pressure are considered inadequate for monitoring.

After probe inspection, a properly calibrated and operating OVA will be connected to the probe's petcock valve with a flexible intake tube, making sure that there is a tight seal. For probes 20 feet deep or less, the OVA will sample gases directly from the probe until there is a steady reading for the LFG concentration on the dial for at least 30 seconds. This steady reading, as well as any peak readings, will be documented in the appropriate field logbooks. The steady reading obtained from the OVA will be the reading used to determine whether soil gas sampling will be required at that particular location.

5.3.2 Soil Gas Sampling

If results from OVA LFG monitoring at OU-3 indicate that soil gas sampling is required, then sampling will be conducted utilizing Summa® canisters to assure sample integrity and prevent leakage. Summa canisters are evacuated stainless steel vessels that have had the internal surfaces specially passivated by the manufacturer using a "Summa" process. This process combines an electropolishing step with chemical deactivation to produce a surface that is chemically inert (Air Toxics, Ltd. 1998).

A soil gas sample will be collected if the OVA reading at a specific probe location registers greater than 500 ppm. The soil gas sample will be collected directly after that specific location's monitoring is completed to alleviate the need to conduct further probe purging.

The soil gas sample will enter the canister through a stainless steel bellows valve, which is designed to control the sample collection rate. The canisters are vacuum sealed and actually "pull" the sample into the canister when the valves are opened. A 5-micrometer in-line filter is utilized to prevent particulate matter from entering the canister, and a vacuum gauge is attached to assure the proper sample volume has been collected. After the appropriate sample volume has been collected, the Summa canister is sealed, disconnected from the soil gas probe, and labeled for laboratory analysis. The soil gas samples will be analyzed by a state of California-certified laboratory for methane and fixed gases using American Society for Testing and Materials (ASTM) Test Method D1945, and for VOCs using U.S. EPA Test Method TO-14.

5.4 SURFACE WATER SAMPLING

Surface water samples will be collected from the four selected sampling locations in accordance with the procedures outlined in SOP 12. Figure 1-3 shows the locations of the selected surface water monitoring locations, while Table 4-4 summarizes the sample test methods. The primary objective of the surface water sampling program is to acquire samples that represent the water quality at a specific time and place with the overall goal being to determine whether COCs in groundwater are migrating beyond site boundaries into Peters Canyon Channel. Care must be taken to avoid potential contamination problems typically associated with surface water sampling, namely:

- cross-contamination from improperly cleaned equipment,
- disturbance of the stream substrate,
- sampling in an unrepresentative area, and
- sampling at an unrepresentative time.

Cross-contamination can be avoided by proper implementation of SOP 11 decontamination procedures. The selected sampling equipment will be based on field conditions and may include the use of Kemmerer Bottles and Bacon Bomb or Dip samplers as described in SOP 12.

5.5 SAMPLING EQUIPMENT DECONTAMINATION AND DISPOSAL OF CONTAMINATED MATERIALS

Sampling equipment will be cleaned and decontaminated according to the following residual contamination removal steps.

1. Wash in a low-phosphate or nonphosphate detergent wash (e.g., Alconox® or Liqui-Nox® solutions made up as directed by the manufacturer).
2. Rinse with potable water.
3. Rinse with deionized or distilled water.

All investigation-derived waste (IDW) materials will be disposed in accordance with contract requirements and methods described in SOP 22 and the Investigation-Derived Waste Management Plan (IDWMP), Attachment D of the OMP. The IDWMP addresses all the IDW issues that may be encountered during the long-term monitoring program.

The LFG monitoring probes and potential subsequent sampling activities will utilize probe-dedicated stainless steel fittings and Teflon® tubing. Therefore, no decontamination activities for LFG monitoring or sampling are required.

5.6 SAMPLE CONTAINERS

Sample containers will be selected in accordance with the U.S. EPA Region 9 Sampler's Guide for the Contract Laboratory Program (U.S. EPA 1992). Sample container selection will be in accordance with the SOP 9.

Groundwater and surface water samples for VOC analyses will be contained in 40-milliliter volatile organic analysis (VOA) glass vials. Groundwater and surface water samples for target analyte list (TAL) metal analyses will be contained in 1-liter polyethylene bottles. All other groundwater and surface water samples will be stored in 1-liter amber glass bottles. Sample containers for water will be provided by the approved laboratory.

As stated in Section 5.3.2, stainless steel Summa canisters will be utilized for soil gas sample collection, if required. This type of sample container was selected in accordance with the U.S. EPA Region 9 Quality Assurance Management Section (U.S. EPA 1996). The "Summa" type of sample container was selected due to the increased container integrity and to alleviate any unwanted contaminant absorption after sample collection.

5.7 SAMPLE PRESERVATION

Samples will be preserved in accordance with U.S. EPA Contract Laboratory Program (CLP) protocols (U.S. EPA 2000). Field and associated QC samples requiring cooling will be maintained at approximately 4 degrees Celsius until shipment to the laboratory.

The required preservation method for groundwater and associated QC samples is as follows.

- Aqueous samples for VOC analyses will be preserved with two drops of 1:1 hydrochloric acid (HCl) (reagent grade) per 40-milliliter glass vial.
- Aqueous samples for total petroleum hydrocarbons as fuel analyses will be preserved with 5 milliliters of 0.1 M HCl (reagent grade) per 1-liter glass bottle.
- Aqueous samples for TAL metals analyses will be preserved with 5 milliliters of 0.1 M nitric acid (reagent grade) per 1-liter polyethylene bottle.
- Aqueous samples for water chemistry analyses do not require addition of preservatives and will be collected in 500-milliliter or 1-liter plastic bottles.

Detailed sample preservation methods are discussed in SOP 9.

No sample preservative is required with the soil gas sampling to be conducted at OU-3, and the sample containers do not require cooling during shipment to the laboratory. The holding time for VOCs in the Summa canisters is 14 days.

5.8 SAMPLE PACKAGING AND SHIPMENT

Samples to be shipped to the selected project laboratory will be accompanied by the appropriate sample transfer and shipment paperwork as described in SOP 10. Chain-of-custody forms and custody seals will be used to document possession and help prevent tampering of samples during shipment to the laboratory. The field investigation crews will prepare all samples for shipment to the laboratory, per the procedures specified in the applicable SOPs, via common carrier. Samples will be packaged properly and dispatched to the designated laboratory (or laboratories) for analysis. The method of shipment, courier name, and other pertinent information will be entered on the chain-of-custody forms. The field teams will package the samples for shipment as follows.

1. Attach sample label to each sample container.
2. Place custody seals on each sample container.
3. Wrap containers in foam sheet or bubble wrap and place them in zip-lock bags.
4. Place the sample container and completed chain-of-custody forms (in a plastic zip-lock bag) inside the shipping container, and place bubble wrap around the sample container to prevent damage during transit.
5. Secure the shipping container with custody seals.
6. At the end of each day or when a shipping container is filled, the field crew will ship the samples to the laboratory via project vehicle and common carrier.

Samples shipped by delivery courier will be in accordance with SOP 10.

5.9 SAMPLE DOCUMENTATION

This section describes the use of all paperwork, including field logbooks, record logs, sample paperwork, chain-of-custody forms, and custody seals.

5.9.1 Field Logbook

Field representatives will maintain a controlled, permanently bound, prenumbered field logbook in accordance with protocols established in SOP 17. The field logbook will be used to record details such as weather conditions, chain of custody, boring locations, sampling events, probe depths, and (if LFG monitoring is required in the future) LFG monitoring results using the OVA and soil gas sample records if Summa canister samples are collected. All entries will be made using waterproof ink and will be signed and dated. Any and all errors made in the field logbook will be corrected by drawing a single line through the error and writing in the correct information. The field logbook will be kept as a permanent record of sampling activities. When the field logbook is completed, it will become part of the permanent project record.

5.9.2 Documents and Chain of Custody

If Summa canister samples are collected, sample-identification documents will be prepared so that sample identification and chain of custody are maintained and sample disposition is controlled. Sample documents will be completed with waterproof ink.

Official custody of samples will be maintained and documented from the time of sample collection until the validation of analytical results. The chain-of-custody record is the document that records the transfer of sample custody.

Once samples are received at the laboratory, laboratory personnel will be responsible for acknowledging receipt of samples and verifying that the containers have not been opened or damaged. It will also be the responsibility of laboratory personnel to maintain custody and sample-tracking records throughout sample preparation and analysis. The chain-of-custody record will become part of the permanent record for site monitoring and will be included in monitoring reports.

5.9.3 Sample Labels

A label will be affixed to every sample container. The label will include:

- project number, CLP case number, and special analytical services number (if applicable);
- sampling location identifier;
- sample number (unique nine-digit sample identification number);
- collector's initials (not preprinted);
- collection date and time;

- analyses to be performed; and
- any special instructions.

Detailed sample custody, transfer, and shipment procedures can be found in SOP 10.

5.10 QUALITY CONTROL SAMPLES

A field program conforming to procedures outlined in the QAPP will be implemented to help maintain the required level of confidence in the field data and to provide cross-checking on the laboratory contracted to perform the analyses.

The following types of field QC samples will be submitted for analysis:

- trip blanks,
- field rinsate blanks, and
- duplicates for laboratory QC sampling and analysis.

Trip blanks will be prepared for all sampling events that involve analysis of water for VOCs. Trip blanks will be prepared by the laboratory using the same type of container, from the same batch of containers, as is used to store the samples. The trip blank will consist of distilled water of known quality with the same preservative as is used for the samples. The trip blank will be carried to the field and returned to the laboratory with the samples without being opened. A trip blank sample will be submitted with every cooler containing VOC samples.

Field rinsate samples will be prepared for all groundwater and surface water sampling events. Field rinsate blanks will be prepared at the site by passing distilled water of known quality through decontaminated or factory-sealed water sampling equipment. At the end of each day or at the completion of work at a site, a team will take one field rinsate sample from each set of sampling equipment just before its final use. The field log will identify the team members, date, and site. This identification procedure will associate the field rinsate samples with a specific team's field decontamination procedure at a site on any day. The rinsate sample sets from the team and site will be submitted each day along with site field samples.

During each sampling event, one source water blank will be prepared using the same distilled water source used to prepare the rinsate sample.

Duplicate samples for laboratory QC will be prepared for all water sampling events. Duplicate samples will be submitted "blind" along with all other samples, and the laboratory staff will not know which samples are duplicates. Duplicate samples will be collected at a rate of approximately 10 percent of the total number of water samples collected during each sampling event.

The number and frequency of trip blanks, equipment rinsate blanks, and duplicates will satisfy Naval Facilities Engineering Service Center requirements.

Due to the nature of potential soil gas sample collection, no field QC samples are required.

Section 6
SAFETY AND HEALTH PLAN

A Site-Specific Safety and Health Plan Supplement for OU-3 is presented as Attachment E to the OMP.

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Section 7
REFERENCES

Air Toxics, Ltd. 1998. Guide to Air Sampling and Analysis, Third Edition.

Bechtel National, Inc. 1999. Draft Final Work Plan Potential Landfill Gas Migration Evaluation, Operable Unit 3, Marine Corps Air Facility Tustin, Orange County, California.

_____. 2001. Addendum No. 3 to the Draft Final Interim Basewide Groundwater Monitoring Plan for Ongoing Monitoring, Marine Corps Air Station, Tustin, California.

_____. 2002. Draft 2001 Annual Groundwater Monitoring Report, Marine Corps Air Station, Tustin, California.

_____. 2003. Navy CLEAN Program Procedures Manual. Latest revision.

BNI. *See* Bechtel National, Inc.

Jacobs Engineering Group Inc. 1993. Marine Corps Air Station Tustin, California, Final Site Inspection Report. Prepared for Southwest Division Naval Facilities Engineering Command.

JEG. *See* Jacobs Engineering Group Inc.

Southwest Division Naval Facilities Engineering Command. 2001. Final Record of Decision/Remedial Action Plan, Operable Unit-3, Moffett Trenches and Crash Crew Burn Pits Site, Marine Corps Air Station Tustin, California. December.

SWDIV. *See* Southwest Division Naval Facilities Engineering Command.

United States Environmental Protection Agency. 1992. Sampler's Guide for the Contract Laboratory Program, First Edition. Office of Solid Waste and Emergency Response. December.

———. 1996. Attachment 1, Region 9 Quality Management Plan. Document Control Number QA09-008-10-93. July.

———. 2000. U.S. EPA Contract Laboratory Program, Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration. 1LM04. 01 January.

U.S. EPA. *See* United States Environmental Protection Agency.

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ATTACHMENT B

QUALITY ASSURANCE PROJECT PLAN

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway
San Diego, California 92132-5190

Contract No. N68711-95-D-7526

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

CLEAN 3

FINAL
QUALITY ASSURANCE PROJECT PLAN
OPERATION AND MAINTENANCE PLAN
OPERABLE UNIT 3
MARINE CORPS AIR STATION TUSTIN
ORANGE COUNTY, CALIFORNIA

CTO-0045/0030
May 2003

REGISTERED
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Jon M. Gilbert, Quality Manager

Signature: Francisco Alloa Ancog — Date: 5/12/03
Nars Ancog, SWDIV Quality Assurance Officer

QUALITY ASSURANCE PROJECT PLAN ELEMENTS

QAPP Element	U.S. EPA QAPP* Section Number	This QAPP Section Number
A. Project Management		
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Verification and Validation Methods	D2	7.2
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Note:
* U.S. EPA. 2001. EPA Requirements for Quality Assurance Project Plans. EPA QA/R-5. March.

Acronyms/Abbreviations:
QAPP – quality assurance project plan
U.S. EPA – United States Environmental Protection Agency

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APPENDIX

FIGURE

TABLES

ACRONYMS/ABBREVIATIONS

ASTM	American Society for Testing and Materials
BEI	Bechtel Environmental, Inc.
BNI	Bechtel National, Inc.
°C	degrees Celsius
CA LUFT	California Leaking Underground Fuel Tank (Manual)
CEG	Certified Engineering Geologist
CIWMB	California Integrated Waste Management Board
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	(United States Environmental Protection Agency) Contract Laboratory Program
COC	chemical of concern
CPR	cardiopulmonary resuscitation
CTO	contract task order
DMP	data management plan
DON	Department of the Navy
DQO	data quality objective
DTSC	(California Environmental Protection Agency) Department of Toxic Substances Control
°F	degrees Fahrenheit
FS	feasibility study
FSP	field sampling plan
HCl	hydrochloric acid
IRP	Installation Restoration Program
JEG	Jacobs Engineering Group Inc.
JP-5	jet propellant grade 5
LCS	laboratory control sample
LFG	landfill gas
LTM	long-term monitoring
LUCICP	land-use control implementation and certification plan
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
MCAS	Marine Corps Air Station
MCL	maximum contaminant level

MCLG	maximum contaminant level goal
MD	matrix duplicate
mg/L	milligrams per liter
mL	milliliter
MS	matrix spike
MSD	matrix spike duplicate
NEESA	Naval Energy and Environmental Support Activity
NFESC	Naval Facilities Engineering Service Center
OCHCA	Orange County Health Care Agency
OMP	operations and maintenance plan
OU	operable unit
OVA	organic vapor analyzer
PARCC	precision, accuracy, representativeness, completeness, and comparability
PE	performance evaluation
PP	program procedure
ppm	parts per million
ppm_v	parts per million by volume
QA	quality assurance
QAO	QA Officer
QAPP	quality assurance project plan
QC	quality control
RI	remedial investigation
RPD	relative percent difference
RPM	remedial project manager
RTM	remedial technical manager
RWQCB	Regional Water Quality Control Board
SOP	standard operating procedure
SWDIV	Southwest Division Naval Facilities Engineering Command
TAL	target analyte list
TPH	total petroleum hydrocarbons
U.S. EPA	United States Environmental Protection Agency
VOA	volatile organic analyte
VOC	volatile organic compound

WBZ	water-bearing zone

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Section 1
INTRODUCTION

This Quality Assurance Project Plan (QAPP) for the Operation and Maintenance Plan (OMP) at Operable Unit (OU)-3, formerly Installation Restoration Program (IRP) Site 1, Moffett Trenches and Crash Crew Burn Pits, Marine Corps Air Station (MCAS) Tustin, California, has been prepared by Bechtel Environmental, Inc. (BEI). BEI prepared this QAPP on behalf of the Department of the Navy (DON), Southwest Division Naval Facilities Engineering Command (SWDIV), in accordance with Contract Task Order (CTO)-0045, issued under the Comprehensive Long-Term Environmental Action Navy (CLEAN) 3 Program, Contract No. N68711-95-D-7526.

The OU-3 site is located in Orange County, California, approximately 40 miles south of downtown Los Angeles and more than 100 miles north of the California/Mexico border. OU-3 is situated along the western bank of Peters Canyon Channel, approximately 700 feet northeast of Moffett Drive. The site is bounded on the east by Peters Canyon Channel, on the north by Edinger Avenue, on the south by Moffett Drive, and on the west by agricultural land.

During the past 20 years, the area to the east of the base has changed from a predominantly agricultural area to a compact residential and industrial/manufacturing area, while land to the west has remained agricultural. Jamboree Road traverses the site from south to north, covering most of it. Based on a 1990 Orange County census (JEG 1993), approximately 260,000 persons reside within a 4-mile radius of the OU-3 site.

1.1 PURPOSE

This QAPP has been prepared to assure that the data collected under the long-term monitoring (LTM) program at OU-3 at MCAS Tustin are precise, accurate, representative, complete, and comparable to actual site conditions, and that they meet the criteria of technical project procedures during sample collection, sample analysis, and data evaluation.

The goal of the OMP at OU-3 is to provide a detailed plan for LTM and operation and maintenance activities at the landfill that will be implemented during the LTM program.

A complete site description and a discussion of the scope of work are included in the Remedial Implementation Plan (BNI 2002a).

1.2 DATA USAGE

The data collected under the LTM program will be used to implement appropriate remedial actions as necessary, facilitate rapid transfer and reuse of the OU-3 property, and enable the DON and regulatory agencies to evaluate the effectiveness of the selected remedy. Groundwater, landfill gas (if required), and surface water analytical data will be used, as required, to demonstrate that the remedial actions at the site are "operating properly and successfully," as described under the Comprehensive Environmental Response, Compensation, and Liability Act Section 120(h)(3) prior to the transfer of analytical data will be compared to "trigger levels," as discussed in Section 3 of the OMP to determine whether additional monitoring or remedial measures are necessary to be implemented at the site, and/or to determine whether the remedial action objectives for the site have been met.

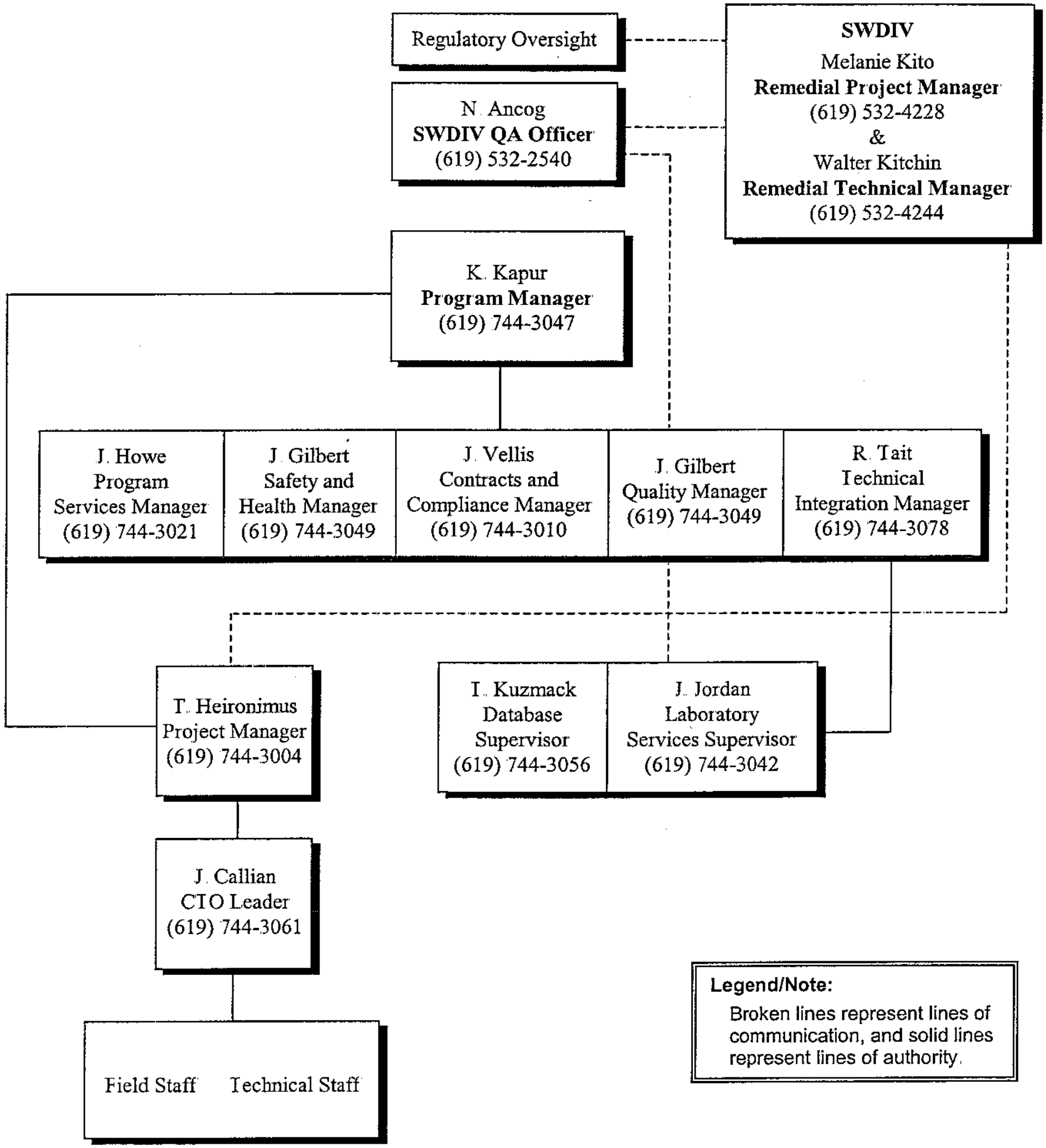
Section 2
PROJECT ORGANIZATION

The project organization for the OMP at OU-3 comprises representatives from the DON, regulatory agencies, the city of Tustin or the designated property transferee, and the contractor or city personnel selected to implement the LTM program. The overall organization and relationships of these representatives are illustrated on Figure 2-1. These representatives will be redesignated as necessary, prior to implementing the LTM program and in the event that the property is transferred between entities.

2.1 PROJECT TEAM ORGANIZATION

The specific responsibilities for the LTM program staff members are described below.

- Program Manager is responsible for all aspects of the LTM program, including assignment of adequate resources to complete the work, conducts technical reviews of deliverables, and performs field operations.
- Project Manager supervises all work performed at the base under the LTM program contract. Responsibilities include project planning, scheduling, staffing, execution of tasks and subcontracts, and managing deliverables.
- Task Leader is responsible for day-to-day supervision of staff and coordination of tasks for project completion. Responsibilities include deliverables production, oversight of data review and management, and quality assurance (QA).
- Quality Manager is responsible for developing the QA process and supervising audits of projects for compliance with program procedures and specifications. The Quality Manager has authority to suspend site or project activities if quality standards are not maintained.
- Technical Integration Manager provides oversight of the technical quality of the project deliverables.
- Safety and Health Manager is responsible for development and implementation of the Program Safety and Health Plan and project-specific modifications and amendments.
- Program Services Manager assists the Task Leader and the Project Manager by providing reports on project budgets, schedules, and costs.
- Contracts and Compliance Manager is responsible for solicitation, selection, and award and management of purchase orders and subcontracts for services and materials required for the project.
- Laboratory Services Supervisor is responsible for selection, coordination, technical oversight, and management of analytical laboratory and data validation subcontracts and services.
- Database Supervisor has oversight responsibility for management of the database, which is the repository of data gathered in the course of the project.



Revised 03/25/02

Figure 2-1
Project Organization Chart

- Field and Technical Staffs consist of technical staff members including Safety and Health trained personnel who are responsible for completing all elements of the OMP, including field investigation, subcontract management, data gathering, data evaluation, and preparation of reports.

2.2 NAVY PROJECT ORGANIZATION

The responsibilities of Navy personnel assigned to LTM program projects are as follows.

- The SWDIV QA Officer (QAO) provides government oversight of the QA program, including review and sign-off on QAPPs and Field Sampling Plans. The QAO provides quality-related direction through the Contract Technical Representative to the Quality Manager. The QAO has authority to suspend affected projects or site activities if SWDIV-approved quality requirements are not maintained. The SWDIV QAO is Nars Ancog who can be reached at (619) 532-2540.
- The Remedial Project Manager (RPM) is the SWDIV manager directly responsible for project execution and coordination with base representatives, regulatory agencies and the SWDIV management team. The RPM for this activity is Melanie Kito who can be reached at (619) 532-4228.
- The Remedial Technical Manager (RTM) is the SWDIV manager directly responsible for project technical issues, including review of all relevant documents for the Navy IRP. The RTM for this activity is Walter Kitchin who can be reached at (619) 532-4244.
- Upon transferring the OU-3 property to the city of Tustin, or in the event the property is transferred to another entity, representatives from the property transferee will be designated having equivalent responsibilities to those listed above.

2.3 REGULATORY OVERSIGHT

Regulatory agency personnel, in conjunction with the DON, the city of Tustin, or other entities, will approve decisions and recommendations presented in the annual reports. The agency project managers are responsible for overseeing and monitoring the progress of work at the site.

Regulatory project managers providing oversight are the California Environmental Protection Agency Department of Toxic Substances Control (DTSC) project manager, the California Regional Water Quality Control Board (RWQCB) Santa Ana Region project manager, and the city of Tustin.

The Land-Use Control Implementation and Certification Plan (LUCICP), Attachment F to this OMP, describes the land-use controls associated with the site, along with appropriate monitoring, inspection, reporting, and enforcement protocols needed to support land-use controls for the selected remedy outlined in the Record of Decision/Remedial Action Plan (SWDIV 2001a). The LUCICP sets forth the respective roles and responsibilities of the DON; future property transferee(s); and the regulatory environmental agencies including United States Environmental Protection Agency (U.S. EPA), DTSC, and RWQCB.

Section 3
QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT

This section describes the overall objectives for data that will be collected under the LTM program at OU-3. These objectives are the basis for determining the types of sampling and analytical methods and QA/quality control (QC) procedures that will be followed.

The data quality objectives (DQOs) were developed in general accordance with the seven-step DQO process outlined in the Guidance for the Data Quality Objectives Process (U.S. EPA 2000) and are discussed in detail in the Field Sampling Plan (Attachment A). The data collected and used shall meet the overall data measurement objectives of this QAPP, including procedures for the collection and assessment of data that are within acceptable tolerances of precision, accuracy, representativeness, completeness, and comparability (PARCC) criteria.

3.1 SUMMARY OF DATA QUALITY OBJECTIVES

Tables 3-1, 3-2, and 3-3 summarize DQOs for the three different types of samples (groundwater, surface water, and landfill gas [if required], respectively) to be collected under the LTM program at OU-3.

3.2 DATA MEASUREMENT OBJECTIVES

Data measurement objectives define data quality requirements to be met in order to support the project DQOs. Data measurement objectives are the determinants of the quality of the data needed to support specific decisions or regulatory actions. To assure attainment of the DQOs, the following data measurement objectives are to be considered:

- specification of particular analytical method and reporting detection limit requirements
- identification of the appropriate laboratory analytical QC requirements
- selection of the appropriate levels of other PARCC criteria for the data
- any specific sample-handling issues or other project-specific issues

The overall objectives of this QAPP are to assure that the collected data are of sufficient quality to support their intended use. This section presents considerations for the DQO process that are applicable to objectives of data measurement.

3.2.1 Quality Assurance Guidance

Analytical QA/QC will be performed in accordance with this QAPP, as supported by the following guidance and technical specifications:

- CLEAN Program Technical Specification for Analytical Laboratory Services 22214-TS-002 (BNI 1998a)
- CLEAN Program Technical Specification for Soil Gas Monitoring 22214-TS-003 (BNI 1995)

Table 3-1
Data Quality Objectives for Long-Term Groundwater Monitoring

Step	Process	Response
1	State the problem.	Based on the RI/FS performed for OU-3, the selected remedial alternative is containment with institutional controls, including groundwater monitoring. The primary groundwater monitoring objective is to demonstrate through monitoring that beneficial uses, human health, and the environment are protected and that the final remedy remains effective in preventing off-site contaminant migration.
2	Identify decisions that address the problem.	• Does groundwater monitoring indicate that off-site contaminant migration at levels exceeding action levels is occurring? • Does groundwater monitoring indicate that the remedy is effective?
3	Identify inputs that affect the decision	Inputs that affect the decision are: • a monitoring network in the critical migration path(s) and at background locations, • water levels from the monitoring wells, • concentrations of site-specific analytes (including chlorinated VOCs, benzene, JP-5, and a few TAL metals) from the monitoring wells, • action levels for groundwater (MCLs, MCLGs, water quality objectives, background levels), and • statistical evaluation of the analytical data.
4	Define the study boundaries.	The horizontal study boundary is the OU-3 property boundary, which will be surveyed by a licensed surveyor and will be provided in the LUCICP before implementing the OMP. The vertical study boundary includes the first and second WBZ (from ground surface to approximately 60 feet below ground surface). The temporal boundary is continued groundwater monitoring until site conditions no longer warrant, as defined during remedial design.
5	Identify decision rules.	• If groundwater monitoring indicates that off-site contaminant migration at concentrations exceeding action levels is occurring, then additional or increased frequency monitoring will be conducted and/or remedial measures will be implemented to prevent off-site contaminant migration. The course of action is defined in the OMP. • If groundwater monitoring indicates that off-site contaminant migration at concentrations exceeding action levels is not occurring, and that the remedy is effective, then further monitoring will be employed to assure the continued effectiveness of the remedy. Modifications to the monitoring frequency may be made based on the results of the annual reports and 5-year detailed reviews.
6	Specify the limits on uncertainty.	A judgmental sampling approach will be used. Therefore, limits on decision errors are not quantifiable. The most severe error would be to conclude that action is not required when, in reality, a threat of migration of groundwater with COCs above action levels exists. The judgmental sampling approach has been designed to minimize the probability of committing this error.

(table continues)

Table 3-1 (continued)

Step	Process	Response
7	Optimize the design.	Water levels will be measured at all OU-3 monitoring wells and groundwater samples will be collected in accordance with the schedule presented in Section 3.1. Samples will be collected from downgradient guard wells and from in-plume and crossgradient wells for VOC analysis using U.S. EPA Method 8260B. Samples will be collected from affected wells for TPH, TAL metals, and water-chemistry-parameter analysis using U.S. EPA Methods 8015-M, 6000/7000 series, 160.1, 300.0, and 310.0. The sampling design will be evaluated annually and updated as needed. The annual monitoring report and the 5-year review are the mechanisms for future recommendations.

Acronyms/Abbreviations:
COC – chemical of concern
FS – feasibility study
JP-5 – jet propellant grade 5
LUCICP – land-use control implementation and certification plan
MCL – maximum contaminant level
MCLG – maximum contaminant level goal
OMP – operation and maintenance plan
OU – operable unit
RI – remedial investigation
TAL – target analyte list
TPH – total petroleum hydrocarbons
U.S. EPA – United States Environmental Protection Agency
VOC – volatile organic compound
WBZ – water-bearing zone

Table 3-2
Data Quality Objectives for Long-Term Surface Water Monitoring

Step	Process	Response
1	State the problem.	Based on the RI/FS performed for OU-3, the selected remedial alternative is containment with institutional controls, including surface water monitoring. The primary surface water monitoring objective is to demonstrate through monitoring that beneficial uses, human health, and the environment will not be impacted by contaminant migration from the site.
2	Identify decisions that address the problem.	• Does surface water monitoring indicate that groundwater with COCs above action levels is migrating into and adversely affecting the high-quality surface water in Peters Canyon Channel? • Does surface water monitoring indicate that the final remedy is effective?
3	Identify inputs that affect the decision.	Inputs that affect the decision are: • upgradient and downgradient monitoring locations in Peters Canyon Channel and Santa Ana-Santa Fe Channel, • stream water levels from the surface water gauging locations in the Santa Ana-Santa Fe Channel and the Peters Canyon Channel, • concentrations of site-specific analytes (including chlorinated VOCs and benzene) from the gauging locations, • action levels for surface water (MCLs, MCLGs, water quality objectives, background levels), and • statistical evaluation of the analytical data.
4	Define the study boundaries.	The horizontal study boundary includes the four surface water monitoring locations in Peters Canyon Channel and Santa Ana-Santa Fe Channel. The vertical study boundary is the base of the Peters Canyon Channel and Santa Ana-Santa Fe Channel at the monitoring locations. The temporal boundary is continued surface water monitoring until site conditions no longer warrant, as defined during remedial design.
5	Identify decision rules.	• If surface water monitoring indicates that groundwater with COCs above action levels is migrating into and adversely affecting the high-quality surface water in Peters Canyon Channel, then perform additional monitoring and/or implement additional remedial action to prevent off-site contaminant migration. The course of action is defined in the OMP. • If surface water monitoring indicates that the remedy is effective and groundwater with COCs above action levels is not migrating into and adversely affecting the high-quality surface water in Peters Canyon Channel, then further monitoring will be employed to assure the continued effectiveness of the remedy. Modifications to the monitoring frequency may be made based on the results of the annual reports and 5-year detailed reviews
6	Specify the limits on uncertainty.	A judgmental sampling approach will be used. Therefore, limits on decision errors are not quantifiable. The most severe error would be to conclude that action is not required when, in reality, a threat of migration of surface water with COCs above action levels exists. The judgmental sampling approach has been designed to minimize the probability of committing this error.

(table continues)

Table 3-2 (continued)

Step	Process	Response
7	Optimize the design.	Water levels will be measured at all OU-3 surface water gauging locations and surface water samples will be collected in accordance with the analytical schedule presented in Section 3.1. Samples will be collected from all surface water gauging locations for VOC analysis using U.S. EPA Method 8260B. The sampling design will be evaluated annually and updated as needed. The annual monitoring report and the 5-year review are the mechanisms for future recommendations.

Acronyms/Abbreviations:
COC – chemical of concern
FS – feasibility study
MCL – maximum contaminant level
MCLG – maximum contaminant level goal
OMP – operations and maintenance plan
OU – operable unit
RI – remedial investigation
U.S. EPA – United States Environmental Protection Agency
VOC – volatile organic compound

Table 3-3
Data Quality Objectives for Long-Term Landfill Gas Monitoring

Step	Process	Response
1	State the problem.	LFG from OU-3 may pose a potential threat to buildings (and future residents) proposed for west of the site.
2	Identify decisions that address the problem.	• Does LFG monitoring indicate that LFG is present at concentrations exceeding 500 ppm_v and is LFG migrating from OU-3?
3	Identify inputs that affect the decision.	Decision inputs include results from OVA LFG readings from the LFG monitoring probes and results from potential soil gas samples collected from the LFG probes.
4	Define the study boundaries.	The horizontal study boundary is the OU-3 property boundary, which will be surveyed by a licensed surveyor and will be provided in the LUCICP prior to implementing the OMP. The vertical study boundary includes the vadose zone within the OU-3 boundaries (from the ground surface to approximately 12 feet below ground surface). The temporal boundary is continued LFG monitoring until site conditions no longer warrant, as defined during remedial design.
5	Identify decision rules.	• If LFG monitoring indicates that LFG is present at concentrations above 500 ppm_v, then additional LFG samples will be collected and analyzed by an off-site laboratory for further evaluation to determine the potential for LFG migration beyond site boundaries. • If LFG monitoring indicates that LFG is not present at concentrations above 500 ppm_v, then no further action for that monitoring event will be required. • If monitoring has been conducted for four consecutive quarters after the remedy has been determined to be operating "properly and successfully," then a report with LFG data will be submitted by SWDIV to CIWMB, the city of Tustin or the designated property transferee, and OCHCA, at which point the sampling frequency will be reevaluated, and may be reduced (i.e., quarterly to semiannually) with the goal of protecting public health and safety.
6	Specify the limits on uncertainty.	A judgmental sampling approach will be used. Therefore, limits on decision errors are not quantifiable. The most severe error would be to conclude that action is not required when, in reality, a threat of LFG migration exists. The judgmental sampling approach has been designed to minimize the probability of committing this error.
7	Optimize the design	As no statistical sampling will be conducted, the design of the judgmental sampling approach will be evaluated annually and updated as needed. The annual monitoring reports and the 5-year reviews are the mechanisms for future recommendations.

Acronyms/Abbreviations:
CIWMB – California Integrated Waste Management Board
LFG – landfill gas
LUCICP – land-use control implementation and certification plan
OCHCA – Orange County Health Care Agency
OMP – operation and maintenance plan
OVA – organic vapor analyzer
ppm_v – parts per million by volume
SWDIV – Southwest Division Naval Facilities Engineering Command

- Navy Installation Restoration Chemical Data Quality Manual (NFESC 2000)
- CLEAN Program Technical Specification for Data Validation Services 22214-TS-004 (BNI 1998b)

QA/QC procedures, documentation, and standards are consistent with U.S. EPA requirements published in the referenced methods and guidance.

3.2.2 PARCC Criteria

PARCC criteria are the qualitative and quantitative indicators of data quality. An objective of this QAPP is to assure that collected data are precise, accurate, representative, complete, and comparable to actual site conditions. PARCC criteria are defined as follows.

Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is determined for analytical results using field and laboratory duplicates and duplicate matrix spike samples. It is expressed in terms of the relative percent difference (RPD) as shown below:

$$RPD = \frac{|C_1 - C_2|}{(C_1 + C_2)/2} \times 100$$

where

C_1 = concentration of sample or matrix spike (MS)
C_2 = concentration of duplicate or matrix spike duplicate (MSD)

Accuracy is the degree of agreement of a measurement (or an average of the same measurement type), with an accepted reference or true value. Accuracy of analytical determinations will be measured using laboratory QC analyses such as laboratory control samples (LCSs), MSs, and surrogate spikes. Accuracy is typically measured by evaluating the QC result against the concentration known to be added, expressed as percent recovery, as shown below:

$$\%R = \frac{S - U}{C_{sa}} \times 100$$

where

$\%R$ = percent recovery
S = measured concentration of spiked aliquot
U = measured concentration of unspiked aliquot
C_{sa} = concentration of spike added

Representativeness is the reliability with which a measurement or measurement system reflects the true conditions under investigation. Representativeness is influenced by the number and location of the sampling points, sampling timing and frequency of monitoring efforts, and the field and laboratory procedures.

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions. Data validation and data quality assessment will determine which data are valid and which data are rejected. Percent completeness is defined as:

$$Percent\ Completeness = \frac{V}{T} \times 100$$

where

V = number of valid (not rejected) measurements over a given time
T = total number of planned measurements

The overall completeness goal for this project will be 95 percent for all validated project data. As a data subset, the most critical data (i.e., as determined by the seven-step DQO process) will have a completeness goal of 100 percent.

Comparability expresses the confidence with which one data set can be compared to another based on using U.S. EPA-defined procedures where available. If U.S. EPA procedures are not available, the procedures have been defined or referenced in this document. Section 7 further summarizes the QC evaluation procedures.

The comparability of data will be established through well-documented methods and procedures, standard reference materials, QC samples and surrogates, and performance evaluation (PE) study results, as well as by reporting each data type in consistent units. Analytical methods employed will be the same or equivalent for all rounds of sampling.

A further discussion of QA/QC samples to be analyzed is presented in Section 6 and in the Laboratory Technical Specifications (BNI 1995, 1998a). Procedures for assessing precision, accuracy, and completeness are presented in Section 7.

Audits, internal QA/QC checks, preventive maintenance, and corrective action, as described in other sections of the document and in the Laboratory Technical Specifications (BNI 1995, 1998a), will be implemented toward maintaining the stated QA/QC objectives.

3.2.3 Field Measurements

Field measurements characterize field conditions during sampling events and are determined in type by the circumstances surrounding a specific sampling event, the nature and anticipated concentrations of the contaminants, and the media to be sampled. Field data will be reported in units consistent with those of other agencies and organizations to allow comparability of databases. Standardized field measurement protocols will be used to the extent possible to maintain consistency and to obtain results that can be verified or validated. Calibration and maintenance of field equipment and instrumentation will be in accordance with manufacturers' specifications or applicable test specifications and the current version of CLEAN Program Standard Operating Procedure (SOP) 6, Instrument Calibration and Use (BNI 2003), or its equivalent. Calibration and maintenance activities will be documented.

Groundwater depths will be measured using an electronic water-level indicator. Conductivity, pH, and temperature will be measured to evaluate stability during well development and purging prior to collecting groundwater samples. An organic vapor meter, a photoionization detector, or a flame ionization detector will be used to monitor for potential organic vapors in both the breathing zone of the workers and at the source of potential vapor generations (generally a borehole or auger collar).

Additional field measurements may be taken during performance of the field activities. The physical measurements will be recorded with the greatest precision allowable by the instrument used. Although detection limits will not be specified for these measurements, limits for measurement tolerance will be specified. Detection limits for volatile organic compound (VOC) screening will be determined by the equipment used. Tolerance limits for field instruments are presented in Table 3-4.

Table 3-4
Tolerance Limits for Field Measurements

Measurement	Tolerance Limit
pH	± 0.1 unit
Conductivity	± 10 µmhos/cm
Temperature	± 0.1 °F
Total volatile organic compounds (by photoionization detector or flame ionization detector)	± 5 ppm*
Distance	± 0.1 foot
Depth to water	± 0.01 foot

Note:
* limit may vary depending on instrument capabilities

Acronyms/Abbreviations:
°F – degrees Fahrenheit
µmhos/cm – micromhos per centimeter
ppm – parts per million

3.2.4 Laboratory Analysis

Fixed-base laboratory analysis provides sample-specific data according to U.S. EPA and Naval Facilities Engineering Service Center (NFESC) requirements. The level of concern or cleanup level selected for the site directly affects data measurement requirements. Therefore, the analytical technique chosen should have a method reporting detection limit at or below the level of concern (to the extent practicable). Regardless of the specified method reporting limit, the actual detection limit reported may be sample-specific, especially in the case of soil samples, samples having complex matrices, or samples containing numerous analytes at widely different concentration ranges. The data measurement objective is to obtain data with reporting limits adequate to satisfy the action levels using the most appropriate methodology.

3.2.4.1 ANALYTICAL METHODS AND DETECTION LIMITS

Table 3-5 lists the analytical methodologies and numbers of samples to be collected during the field activities. Table 3-6 presents target detection limits.

3.2.4.2 QUALITY CONTROL ANALYSES

An LCS or method blank spike sample and a method blank will be analyzed with each analytical/QC batch containing a total of 20 or fewer project samples. An MS and an MSD will be analyzed for organic analyses at a frequency of one set per 20 environmental samples or one per analytical/QC batch of analyzed samples, whichever is more frequent. An MS and an MSD will be analyzed for metals analyses and all applicable inorganic analyses at a frequency of one set per 20 environmental samples. Surrogates will be added to all samples for organic analyses, as applicable.

3.2.4.3 QUALITY CONTROL ACCEPTANCE CRITERIA

At a minimum, the laboratory will maintain control charts for LCS analyses and will generate acceptance limits based on historical recoveries in accordance with the Laboratory Technical Specifications (BNI 1995, 1998a). The acceptance limits for the method blank will be the detection limit. The laboratory will comply with limits for MS recoveries, duplicate and MSD precision, and surrogate recoveries in accordance with the Laboratory Technical Specification programmatic analytical DQOs or U.S. EPA methods. Table 3-6 presents the accuracy and precision criteria for the methods to be used in this project. The laboratory will take corrective action as required in the Laboratory Technical Specifications (BNI 1995, 1998a) to correct or address out-of-control events. Such actions may include sample reextraction and/or reanalysis. Noncompliant QC results attributed to sample matrix effects will be documented and noted in the laboratory reports.

Table 3-5
Analytical Testing Schedule and Sampling Parameters

Station Identification	Monitoring Zone	Relative Location	QUARTER 1		QUARTER 2				QUARTER 3		QUARTER 4		
			VOCs[a]	TPH-Fuel[b]	VOCs	TAL Metals[c]	Water Chemistry[d]	TPH-Fuel	VOCs	TPH-Fuel	VOCs	TAL Metals	TPH-Fuel
Groundwater[e]													
I001BC43S	First WBZ	Background				X	X						
I001BC47S	First WBZ	Background				X	X						
I001BC49S	First WBZ	Downgradient			X	X	X				X	X	
I001BC50S	First WBZ	In plume			X	X	X	X			X	X	X
I001MW52S	First WBZ	In plume			X	X	X				X	X	
I001MW53S	First WBZ	In plume	X		X	X	X		X		X	X	
I001MW43D	Second WBZ	Background				X	X						
I001MW47D	Second WBZ	Background				X	X						
I001MW50D	Second WBZ	In plume			X	X	X	X			X		X
I001MW52D	Second WBZ	Downgradient			X	X	X						
I001MW53D	Second WBZ	In plume			X	X	X				X		
Surface Water													
1SW03	First WBZ	Upstream	X		X				X		X		
1SW04	First WBZ	Adjacent	X		X				X		X		
1SW06	First WBZ	Downstream	X		X				X		X		
1SW07	First WBZ	Adjacent	X		X				X		X		

Notes:

[a] VOC analyses will be performed on groundwater and surface water samples using U.S. EPA Method 8260B (or equivalent), and on landfill gas samples (if required) using an organic vapor analyzer; if total VOCs in individual landfill gas samples exceed 500 parts per million, then soil gas samples will be collected and analyzed for total VOCs using U.S. EPA Method TO-14, and for methane using ASTM D1945

[b] TPH-fuel analyses will be performed using U.S. EPA Method 8015-M

[c] TAL metals analyses will be performed using U.S. EPA Method 6000/7000 series

[d] water chemistry analyses include common anions (chloride, nitrate, phosphate, and sulfate) analyzed using U.S. EPA Method 300.0, alkalinity using U.S. EPA Method 310.1, and total dissolved solids using U.S. EPA Method 160.1

[e] the analytical schedule for groundwater monitoring was taken from Addendum No. 3 to the draft final Interim Basewide Groundwater Monitoring Plan (BNI 2001) with revisions approved by the Base Closure Team during a November 2001 meeting; these revisions are presented in the 2002 Sampling and Analysis Schedule in the 2001 draft Annual Groundwater Monitoring Report (BNI 2002b)

Acronyms/Abbreviations:

ASTM – American Society for Testing and Materials
TAL – target analyte list
TPH – total petroleum hydrocarbons
U.S. EPA – United States Environmental Protection Agency
VOC – volatile organic compound
WBZ – water-bearing zone

Table 3-6
Long-Term Monitoring Program Analytical Data Quality Objectives
(for water)

Analytical Category and Parameter	Method	Target Detection Limits	MS/MSD or Surrogate Accuracy Criteria (% Recovery) Water	LCS[a] Accuracy Criteria (% Recovery) Water	Precision (Maximum RPD) Water
Volatile Organic Compounds	U.S. EPA Method 8260B (EPA SW-846)				
Benzene[b]		0.5 µg/L	75–130	70–120	20
Chlorobenzene[b]		0.5 µg/L	75–130	70–130	20
1,2-Dichloroethane		0.5 µg/L	75–125	75–125	20
1,1-Dichloroethene[b]		0.5 µg/L	60–145	70–130	20
trans-1,2-dichloroethene		0.5 µg/L	75–125	75–125	25
Ethylbenzene		0.5 µg/L	75–125	75–125	20
Tetrachloroethene		0.5 µg/L	75–125	75–125	20
Toluene[b]		0.5 µg/L	75–125	70–115	20
1,1,1-Trichloroethane		0.5 µg/L	75–125	75–125	20
Trichloroethene[b]		0.5 µg/L	70–120	70–115	20
Xylenes (total)		1.0 µg/L	75–125	75–125	20
Surrogates					
Bromofluorobenzene		NA	85–115	80–115	NA
1,2-Dichloroethane-d_4		NA	75–115	80–125	NA
Toluene-d_8		NA	90–110	70–120	NA
Total Fuel Hydrocarbons	U.S. EPA Method 8015-M (CA LUFT Manual)/EPA SW-846				
Gasoline		50 µg/L	20–135	65–125	30
Diesel		100 µg/L	35–115	35–115	30
Surrogates					
bis-2(ethylhexyl)phthalate		NA	70–125	70–125	NA
Bromofluorobenzene		NA	55–165	60–150	NA
n-eicosane		NA	25–95	25–95	NA
2-Fluorobiphenyl		NA	50–150	50–150	NA
di-n-octyl phthalate		NA	10–120	10–120	NA
Terphenyl		NA	50–150	50–150	NA
Metals[c]					
Aluminum		0.1 µg/L	75–125	95–115	20
Antimony		0.02 µg/L	75–125	80–110	20
Arsenic		0.5 µg/L	75–125	80–120	20

(table continues)

Table 3-6 (continued)

Analytical Category and Parameter	Method	Target Detection Limits	MS/MSD or Surrogate Accuracy Criteria (% Recovery) Water	LCS[a] Accuracy Criteria (% Recovery) Water	Precision (Maximum RPD) Water
Metals[c] (continued)					
Barium		0.02 µg/L	75–125	85–105	20
Beryllium		0.02 µg/L	75–125	85–105	20
Cadmium		0.02 µg/L	75–125	75–110	20
Chromium (total)		0.2 µg/L	75–125	80–110	20
Cobalt		0.02 µg/L	75–125	80–105	20
Copper		0.02 µg/L	75–125	85–105	20
Iron		0.2 µg/L	75–125	80–115	20
Lead (total)		0.02 µg/L	75–125	80–120	20
Manganese		0.02 µg/L	75–125	85–105	20
Mercury		0.2 µg/L	75–125	80–120	20
Nickel		0.2 µg/L	75–125	80–105	20
Selenium		0.5 µg/L	75–125	80–120	20
Silver		0.02 µg/L	75–125	80–120	20
Thallium		0.02 µg/L	75–125	80–115	20
Vanadium		0.02 µg/L	75–125	80–115	20
Zinc		0.5 µg/L	75–125	80–110	20
Wet Chemistry					
Alkalinity	U.S. EPA Method 310.1	20 mg/L	NA	80–120	20
Chloride	U.S. EPA Method 300.0	0.2 mg/L	75–125	80–120	20
Nitrates (NO_3-N)	U.S. EPA Method 300.0/353.2	0.2 mg/L	75–125	80–120	20
Nitrite (NO_2-N)	U.S. EPA Method 300.0/353.2	0.2 mg/L	75–125	80–120	20
ortho-phosphate	U.S. EPA Method 300.0/365.3	0.2 mg/L	75–125	80–120	20
Sulfates (SO_4)	U.S. EPA Method 300.0	0.2 mg/L	75–125	80–120	20

(table continues)

Table 3-6 (continued)

Notes:
[a] LCS accuracy criteria are for guidance only; laboratory specific limits are determined utilizing control charts generated during the analysis of CLEAN Program samples; use these limits until sufficient data are generated
[b] for all QC samples, at a minimum, these compounds must be spiked
[c] the QC criteria for metals apply to all analyses by U.S. EPA Methods 6010B, 6020, and 7000 series

Acronyms/Abbreviations:
CA LUFT – California Leaking Underground Fuel Tank
CLEAN – Comprehensive Long-Term Environmental Action Navy
LCS – laboratory control sample
µg/L – micrograms per liter
mg/L – milligrams per liter
MS – matrix spike
MSD – matrix spike duplicate
NA – not applicable
QC – quality control
RPD – relative percent difference
U.S. EPA – United States Environmental Protection Agency

3.3 STANDARD OPERATING PROCEDURES

In the event that the DON or BEI does not implement the OMP, the contractor selected to implement the OMP may use the CLEAN Program SOPs and Program Procedures (PPs) (BNI 2003), or their equivalents. CLEAN Program SOPs are public documents, and will be made available by the DON for use by the city of Tustin or the contractor selected to implement LTM activities. It is anticipated that the following CLEAN Program SOPs or their equivalents will be followed under the LTM program at OU-3:

- SOP 6, Instrument Calibration and Use
- SOP 7, Water and Free Product Level Measurement in Wells
- SOP 8, Groundwater Sampling
- SOP 9, Sample Containers, Preservation, and Handling
- SOP 10, Sample Custody, Transfer, and Shipment
- SOP 11, Decontamination of Equipment
- SOP 12, Surface Water Sampling
- SOP 17, Logbook Protocols
- SOP 22, Investigation-Derived Waste Management

SOP 6, Instrument Calibration and Use, describes the general procedures to be employed for the calibration and use of equipment and instruments commonly used for field measurements and sample screening. The procedure is intended for use with instruments and equipment outside of safety, health physics, or industrial hygiene monitoring purposes.

SOP 7, Water and Free Product Level Measurement in Wells, identifies the methods to be used for the measurement of water and free product levels in wells and to provide standardized reporting formats for documentation of data.

SOP 8, Groundwater Sampling, provides direction to assure that a groundwater sampling event obtains accurate water-quality data that are representative of the groundwater being monitored at the time of the collection. The procedure also promotes the proper collection of groundwater samples through adherence to a site-specific Field Sampling Plan (FSP) and implementation of QA/QC measures. The procedure is intended for use by geologists and environmental engineers in association with hydrogeologic/hazardous waste investigations. It applies to the collection and handling of groundwater samples collected from existing or newly installed wells.

SOP 9, Sample Containers, Preservation, and Handling, assures that the integrity of samples is maintained for analysis. The procedure applies to all environmental samples collected by environmental engineers and geologists. It describes the various sample container types and preservatives available for the collection of samples, and it provides guidelines for the appropriate handling of these samples.

SOP 10, Sample Custody, Transfer, and Shipment, assures that the integrity of samples is maintained throughout the sample transfer process. The procedures describe protocols for the custody, transfer, and shipment of environmental and industrial samples from the point of collection to analysis and disposal by a designated analytical laboratory. The procedure applies to all environmental and industrial hygiene samples collected and submitted for archiving or analysis.

SOP 11, Decontamination of Equipment, assures correct equipment decontamination procedures are followed to prevent cross-contamination of samples.

SOP 12, Surface Water Sampling, provides direction to assure that a surface water sampling event obtains accurate water-quality data that are representative of the surface water being monitored at the time of the collection. The procedure also promotes the proper collection of surface water samples through adherence to a site-specific FSP and implementation of QA/QC measures. The procedure is intended for use by geologists and environmental engineers in association with hydrogeologic/hazardous waste investigations.

SOP 17, Logbook Protocols, provides procedures and guidance for the labeling, use, and control of logbooks used to document field data-collection activities.

SOP 22, Investigation-Derived Waste Management, provides program-wide instructions on managing investigation-derived waste generated during field activities. It also offers guidance for the preparation of a site-specific investigation-derived waste management plan, which will provide site-specific details of issues such as the areas to be investigated, the chemicals of potential concern, the waste types and volumes to be generated, and specific handling and disposal options.

Controlled copies of all SOPs will be provided to SWDIV, DTSC, and U.S. EPA Region 9 for use during the LTM program.

3.4 SPECIAL TRAINING AND CERTIFICATION

All personnel who work at a known or potentially hazardous waste site are required to meet the safety and health training requirements of Title 29, *Code of Federal Regulations* Part 1910.120(e). Depending on individual responsibilities in the field and the complexity of a particular project, on-site personnel may have to meet special training requirements defined in the OMP.

Copies of personnel safety and health training records, including course completion certificates for initial safety and health training, first aid, cardiopulmonary resuscitation (CPR), and annual 8-hour refresher training, will be maintained in the project files. Subcontractors that work on-site will certify that their employees have been trained for work on hazardous waste project sites.

Section 4
SAMPLE COLLECTION

An objective of the sampling procedures outlined in this project plan is to obtain representative samples that yield results of consistent quality. The use of proper sampling techniques, sampling equipment, strict sampling controls in the field, and appropriate chain-of-custody procedures will reduce the potential for nonrepresentative samples and unreliable analytical data. QA/QC objectives pertinent to proper sampling procedures are outlined in this section.

4.1 SAMPLING DESIGN

A summary and rationale for the proposed sampling locations, sample types, sample analysis, and sample frequency are presented in the Section 5 of the FSP (Attachment A). Also included in the FSP sections are detailed descriptions of activities planned for the LTM period.

4.2 SAMPLING EQUIPMENT AND PREPARATION

All nondisposable sampling equipment and material, tools, and field-measurement devices will be decontaminated before and after each sample collection or use at each location to prevent accidental sample contamination or flawed field measurements. Decontamination procedures for sampling equipment and measurement devices are presented in Section 5.5 of the FSP and in SOP 11, Decontamination of Equipment, or its equivalent. Disposal and management of all investigation-derived waste will be the responsibility of the city of Tustin, as specified in the OMP.

4.3 SAMPLE CONTAINERS

All sample containers are to be supplied by the subcontract laboratory designated for analytical services. The sample containers will be cleaned and QC-tested by procedures appropriate to the specific analyses to be performed. Sample containment will follow the prescribed U.S. EPA Contract Laboratory Program (CLP) Sample Bottle Repository Program (U.S. EPA 1992) procedures to assure that containers are free of contaminants. This QC testing will be verified or performed by the laboratory prior to shipping the containers to the field sampling team. Preservatives, when required, will be added to the sample container by the laboratory before shipment to the field. Sample containers with caps (e.g., glass jars, volatile organic analyte [VOA] vials, amber bottles, or polyethylene bottles) will be shipped to the user with sample coolers in protective cardboard cartons or other wrapping. Glass containers (including VOA vials) will be provided with Teflon®-lined caps or Teflon septa, and all polyethylene containers will be provided with polypropylene closures. Table 4-1 indicates the U.S. EPA method, type of container and preservative required, and the holding time for chemicals of potential concern for organics and inorganics, respectively.

The FSP provides guidance on the appropriate sample containers, sample volumes, preservatives, and holding times for analytical parameters. The sampler must use the appropriate sample container as specified by the analytical method for each sample type.

Table 4-1
Sample Containers, Preservatives, and Holding Times

Analyte	Container	Preservative	Holding Time
Volatile organic compounds	3 × 40 mL VOA vials	Cool to 4 °C, HCl to pH < 2	14 days
Total petroleum hydrocarbons	2 × 1 liter amber glass	Cool to 4 °C, HCl to pH < 2	7/40 days*
Target analyte list metals	1 × 1 liter plastic	Cool to 4 °C, 5 milliliters of 0.1 M nitric acid	6 months except mercury 28 days
Alkalinity	1 × 500 mL plastic	Cool to 4 °C	14 days
Total dissolved solids	1 liter plastic	Cool to 4 °C	7 days
Anions (except nitrate)	1 liter plastic	Cool to 4 °C	28 days
Nitrate	1 liter plastic	Cool to 4 °C	48 hours
Volatile organic compounds	Summa® canister	None required	14 days

Note:
* 7 days to extract, 40 days to analyze

Acronyms/Abbreviations:
°C – degrees Celsius
HCl – hydrochloric acid
mL – milliliter
VOA – volatile organic analyte

4.4 SAMPLE COLLECTION

Field methods and procedures for sample collection will be conducted as described in the OMP and will be in accordance with the current applicable SOPs. If necessary, soil gas sample collection will follow procedures described in the Technical Specification for Soil Gas Monitoring (BNI 1995) and in other relevant guidance such as RWQCB Los Angeles Region soil gas guidelines (included as Appendix A of this QAPP).

4.5 SAMPLE HANDLING AND SHIPMENT

Documentation for sampling activities is detailed in the FSP and discussed in Section 5 of this QAPP. Sample packaging and shipping procedures are based on U.S. EPA specifications as well as U.S. Department of Transportation regulations (49 *Code of Federal Regulations*). Wet ice will be included in coolers containing samples that require temperature control as specified in the FSP. To assure that required analytical holding times are met, all samples will be delivered to the laboratory by field personnel, transported by a laboratory courier, or shipped to the laboratory via an express mail service within 12 hours of sample collection. The FSP and SOP 10, Sample Custody, Transfer, and Shipment, or its equivalent, describe packing and shipment of samples.

Upon receipt by the laboratory, samples will be stored in accordance with procedures established by the U.S. EPA in the CLP Statement of Work, CLEAN Program Technical Specification for Analytical Laboratory Services (BNI 1998a) or its equivalent, and the Navy Installation Restoration Chemical Data Quality Manual (NFESC 2000).

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Section 5
SAMPLE CUSTODY/DOCUMENTATION

Sample custody and documentation are important elements of generating acceptable and defensible data. Each sample or field measurement must be properly documented to facilitate timely, correct, and complete analysis and to support use of field and laboratory data. The documentation system provides the means to identify, track, and monitor each sample from the point of collection through final data reporting. Specific documentation requirements are described in the following sections.

5.1 FIELD SAMPLE CUSTODY AND DOCUMENTATION

Sample custody and documentation methods that will be used are described in SOP 10, Sample Custody, Transfer, and Shipment, and SOP 17, Logbook Protocols, or their equivalents. These SOPs address field logbooks, sample labels, custody seals, and chain-of-custody forms.

5.1.1 Field Logbooks and Records

Controlled, prepaginated, and permanently bound logbooks will be used to record field observations and measurements to provide a permanent record of daily field activities. The logbooks will contain various forms for this purpose, including daily field reports, geologic drill logs, well-sampling records, groundwater-level records, contractor production reports, and photodocumentation.

Entries will be legible and written in indelible ink. Corrections will consist of line-out deletions that will be initialed and dated by the person making the correction. All entries will be signed and dated, and the remaining space on each page will be crossed out. Completed field logbooks will be delivered to the project office. Other forms used to record field safety and health-related data will not be bound into field logbooks, but will instead be maintained in project files and folders. Logbook procedures are described in SOP 17.

5.1.2 Photographs

Photographs may be taken of the sample locations to show the surrounding area and objects used to locate the site. The photographs will be used to provide backup documentation for procedures and unusual conditions encountered as well as general sampling locations. Photographs will be taken at each sampling location and will be described in the field logbook in accordance with all SWDIV rules regarding photographs. Photographs should include two or more reference points to allow relocation of the sampling point at a later time. The film roll number will be identified by taking a photograph of an informational sign on the first frame of the roll. This sign will display the site name, initials of the photographer, film roll number, and date. After the photographs are developed, they will be labeled for cross-referencing with other field data.

5.1.3 Sample Labeling

Sample labels will be attached to each sample container just before or at the time of sampling. The labels will be made of waterproof paper or plastic with gummed backs and will be completed with indelible ink. Any errors made on the sample label will be lined out using a single line through the error (initialed) followed by the entry of the correct information. Sample labels will clearly indicate the project name and number, sampling location identifier, the nine-digit sample number (container identification number), sampling date and time (using 24-hour notation), analysis to be performed, sample preservation, and the field sampler's name and initials (not preprinted) as described in Section 5.9.3 of the FSP and in SOP 9, Sample Containers, Preservation, and Handling, and SOP 10, or their equivalents.

All environmental samples collected to support the remedy at OU-3 will be identified by a unique nine-digit sample numbering system as described in the FSP, the Data Management Plan (DMP) (Attachment C), and PP T 2.2, Sample Implementation Management System (SIMS), or its equivalent.

5.1.4 Chain-of-Custody Records

The chain-of-custody record documents the transfer of sample custody from the time of sampling to laboratory receipt. SOP 10 contains a description of chain-of-custody procedures. Chain-of-custody forms will be completed by the sampler and will accompany the samples from the field to the analytical laboratory.

The custody record will be completed using waterproof ink. All corrections will be made by drawing a line through, initialing, and dating the error, and then entering the correct information. Erasures are not permitted. All applicable information on the chain-of-custody record, including signatures, will be filled out completely and legibly. Unused space (rows) for sample/analysis information will be crossed out, initialed, and dated. Samples requiring different turnaround times will not be included together on the same chain-of-custody record. If samples are to be delivered to the laboratory by an overnight carrier, the airbill number will be recorded, and the chain-of-custody record(s) will be placed in a waterproof plastic bag that is taped to the lid inside the sample cooler prior to sealing.

5.1.5 Custody Seals

After samples are collected, custody seals are placed on the sample containers, including VOA vials. Custody seals are used to detect tampering between sample collection and analysis. The seal is placed so that it must be broken in order to open the sample container. Two or more custody seals will be placed on the outside of the shipping container or cooler prior to shipment through an overnight carrier. Each custody seal affixed to sample containers and sample coolers will be signed and dated by the field sampler. Custody seals are described in SOP 10.

5.1.6 Sample Transport

The sample transport procedures will be conducted following SOP 9 and SOP 10, or their equivalents, consistent with applicable U.S. EPA guidance and requirements.

5.2 LABORATORY SAMPLE CUSTODY AND DOCUMENTATION

Each subcontract laboratory used during the LTM period at OU-3 will be required to establish custody procedures that conform to those required by the CLP, as outlined in the CLP user's guide (U.S. EPA 1991). These procedures include:

- designation of a sample custodian;
- completion by the custodian of the chain-of-custody record, any sample tags, and laboratory request sheets, including documentation of sample condition upon receipt;
- laboratory sample tracking and documentation procedures;
- secure sample storage with the appropriate environment (e.g., refrigerated, dry); and
- proper data logging and documentation procedures, including custody of all original laboratory records.

A designated sample custodian will take custody of all samples upon their arrival at the laboratory. The custodian will inspect all sample labels and custody forms to assure correspondence between information on the labels and forms. The custodian will also inspect all samples and document any signs of damage or tampering and temperature discrepancies. The custodian will then assign a unique laboratory number to each sample and will distribute the samples to the appropriate analysts or to secured storage areas. All sample transfers in the laboratory will be recorded.

5.3 CORRECTIONS TO DOCUMENTATION

All original recorded data shall be written in waterproof ink. No accountable serialized documents will be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document. If an error is made on an accountable document assigned to an individual, that individual shall make corrections by making a line through the error (initialed) and entering the correct information. The erroneous information shall not be obliterated. Any subsequent error discovered on an accountable document shall be corrected, initialed, and dated by the person who made the entry.

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Section 6
QUALITY CONTROL PROCEDURES

Analytical QA/QC procedures encompass the requirements established by the Navy Installation Restoration Chemical Data Quality Manual (NFESC 2000), the CLEAN Program Analytical Laboratory Technical Specifications (BNI 1995, 1998a), and U.S. EPA method-specific criteria. These procedures will be provided for by the laboratory QA program, be supported by SOPs, and will address QC samples, instrument calibration, preventive maintenance, internal QC checks and corrective action, and data review and reporting.

Both field and laboratory QA/QC checks will be employed to evaluate the performance of field and laboratory analytical procedures. QA/QC checks will take the form of samples introduced into the sampling, sample transport, and analytical stream to enable evaluation of analytical accuracy and precision, as well as representativeness.

6.1 LABORATORY QUALITY ASSURANCE PROGRAM

Analytical laboratories will maintain a written quality assurance plan in accordance with the Laboratory Technical Specification, Section 4.11 (BNI 1998a), and the Navy Installation Restoration Chemical Data Quality Manual (NFESC 2000). All subcontractor laboratories (fixed-base and mobile) have the appropriate current state certifications, such as the California State Environmental Laboratory Approval Program certification. The fixed-base laboratories have undergone the NFESC evaluation process and maintain current approval.

6.2 LABORATORY STANDARD OPERATING PROCEDURES

The subcontract laboratory shall maintain a controlled set of SOPs that meet the requirements established in the Laboratory Technical Specification, Section 4.1 (BNI 1998a), and the Navy Installation Restoration Chemical Data Quality Manual (NFESC 2000). SOPs shall serve as the implementing procedures for the laboratory QA program and must be clear, comprehensive, up-to-date, and sufficiently detailed to permit duplication of analytical results by qualified analysts. The laboratory must have an SOP for each of the reference methods performed on the project prior to commencement of work. Controlled revision to SOPs must be provided for in the laboratory QA program.

6.3 FIELD AND LABORATORY QUALITY CONTROL SAMPLES

QC samples are used to assess data quality in terms of precision and accuracy and verify that sampling procedures, decontamination, packaging, and shipping are not introducing variables into the sampling chain that could compromise the validity of sample data. Such QC samples are regularly prepared in the field and laboratory so that all phases of the sampling process are monitored. The types of QC samples to be collected during the project are discussed below.

6.3.1 Duplicates

Field duplicates are two samples of the same matrix, collected at the same location and time (to the extent possible), with an assumed level of overall homogeneity within the sample matrix. The same sampling techniques and analytical methods are performed on both samples. Analysis of field duplicates provides a quantitative measure of the precision of the overall sampling and analysis process as the sum of contributions from sample heterogeneity, the precision of the sampling process, and the analytical method(s).

Duplicate water samples will be collected at a frequency of one duplicate for every ten field samples.

6.3.2 Blanks

A variety of QC blank samples will be used to assess the potential for sample contamination during the sampling and analysis processes. Laboratory QC samples used for assessing the impact of contamination on sample results include method blanks, calibration blanks, instrument blanks, and refrigerator storage blanks. The laboratory will use these QC sample types in accordance with U.S. EPA method-specific requirements, the Laboratory Technical Specification, Section 4.11 (BNI 1998a), and the Navy Installation Restoration Chemical Data Quality Manual (NFESC 2000). In addition, three kinds of field QC blanks will be used: trip blanks, equipment rinsate blanks, and source water blanks.

Trip blanks are used to detect contamination introduced during sample handling and shipment. Trip blanks are prepared by the laboratory using contaminant-free reagent-grade water and are shipped to the field together with sample containers. They are not opened in the field and are returned to the laboratory in every sample cooler containing samples to be analyzed for VOCs.

An equipment rinsate blank is a sample of contaminant-free water that has been passed through or over recently decontaminated field sampling equipment. The equipment blank is used to assess the adequacy of the equipment decontamination process, as well as contaminant effects from handling, storage, shipment, and analysis. Equipment rinsate blanks will be prepared by the sample team at a minimum of one set (for all parameters of concern) per day.

Source water blanks are used to assess the potential for sample contamination from the final rinsewater of the decontamination process. One blank from each source water location will be collected and analyzed for the same parameters as the related samples.

6.3.3 Spikes

The types of QC spike samples to be employed by the fixed-base laboratory include LCSs (or method blank spikes), MSs, and surrogates. An LCS is a clean matrix (i.e., same used for a method blank) spiked with known concentration(s) of target analyte(s). The LCS is carried through the entire analytical procedure to assess the overall accuracy of the method. An MS is an aliquot of a parent (CLEAN Program) sample spiked with target analyte(s) of known concentration(s) prior to sample preparation. The impact of sample matrix on target analyte recovery (i.e., accuracy) and precision is assessed by MS, MSD, and unspiked matrix duplicate (MD) QC samples. A surrogate is a nontarget analyte spiked at known concentration prior to sample preparation. Surrogate analytes are used to monitor method performance on a matrix-specific/sample-specific basis.

For this project, the acceptance limits for precision and accuracy for MSs and surrogate percent recovery are presented in Table 3-6. Each analytical preparation batch must contain two matrix QC samples: organic analyses require an MS/MSD pair, and inorganic analyses generally require an MS/MD pair.

6.4 INTERNAL LABORATORY QUALITY CONTROL CHECKS

Laboratory checks will include the procedures detailed below.

- The reagents, gases, and standards required by a method will use the highest quality standards available. Materials and procedures will be recorded in a logbook to document complete traceability to a certified reference standard and source such as the National Institute of Standards and Technology.
- Instruments will be calibrated according to the manufacturer's instructions and as required by the U.S. EPA CLP or SW-846 analytical method. Where there are no specifications for each parameter, a five-point calibration curve will be implemented.
- Calibration of instruments will be documented in a bound logbook, and records will be maintained in accordance with Section 4.6 of the Laboratory Technical Specification (BNI 1998a).
- Continuing calibration standards will be analyzed and documented in a logbook for each analytical method during sample analysis as required by the method.
- The percent recovery and percent difference criteria for inorganics and organics continuing calibration shall be within the QC criteria of the requested method.

The term "matrix" refers to the use of the actual sample media collected in the field. Laboratory QC samples are derived from an aliquot (subset) of the field samples. A routinely collected soil or sediment sample contains sufficient volume for analysis of the parent sample, MS, and MSD. Generally, triple volumes of water samples are supplied to the laboratory, and requests for MS and MSD analyses are noted on the chain-of-custody document.

6.4.1 Control Charts

Control charts will be used by the fixed-base laboratory to assess variability in QC parameters over time. At a minimum, the laboratory shall control chart LCS results for each method of analysis. In addition, all surrogate spike recoveries (from LCS results) shall be monitored by use of control charts. In cases for which surrogate spikes are not applicable, MSs shall be monitored for accuracy. The laboratory will include in its QA plan a description of the methodology used in control charting. Section 4.3 of the Laboratory Technical Specification (BNI 1998a) details the requirements for control charting and criteria for out-of-control conditions.

6.4.2 Performance Evaluation Samples

PE samples may be submitted to the fixed-base laboratory as part of the routine laboratory evaluation process according to NFESC (2000). If authorized by the SWDIV QAO or equivalent, then a single-blind or double-blind PE sample will be sent to the laboratory.

6.5 INSTRUMENT CALIBRATION

The laboratories are required to document calibration procedures according to Section 4.6 of the Laboratory Technical Specification (BNI 1998a), and are subject to review by auditors under the direction of the Program Quality Manager. Calibration procedures will be consistent with specified method requirements. Calibration of field equipment and instrumentation will be in accordance with the relevant SOPs.

6.6 PREVENTIVE MAINTENANCE

The laboratory will perform and maintain records of preventive maintenance on instruments used for analysis of project samples. Preventive maintenance documentation is incorporated into California laboratory certification requirements and is an element of the laboratory QA plan.

6.7 INTERNAL QUALITY CONTROL AND CORRECTIVE ACTION

A method blank will be analyzed with every batch of 20 or fewer samples to measure laboratory contamination. The method blank will consist of analyte-free water and will be carried through the entire preparation and analysis procedure. Acceptance criteria for method blanks must conform to reference method requirements when specified. Generally, corrective action is required if target compound concentrations in the method blank are greater than the method detection limit. Corrective action, including data flagging, is required when method blank concentrations are greater than the reporting detection limit, and the samples must be reprocessed if sample target compound/analyte concentrations are not greater than 10 times the method blank concentrations.

An LCS will be analyzed with every batch containing 20 or fewer samples to measure accuracy. The LCS will consist of a method blank spiked with a known amount of analyte, and it will be carried through the entire preparation and analysis procedure. The standards source will be separate from that used to prepare calibration standards. All target VOC compounds and metals will be used for spiking the LCS in accordance with the Laboratory Technical Specification (BNI 1998a); all analytes will be spiked for other inorganic analyses when appropriate. The recoveries will be plotted on control charts, and control limits will be calculated based on historical data. The guidance limits for the

LCS listed in Table 3-6 will be used until the laboratory has enough LCS data to control chart (BNI 1998a). If control limits are exceeded, the analysis will be stopped and the problem corrected. Samples associated with the out-of-control LCS will be reanalyzed in another batch, unless documented evidence is presented to show that associated samples were not affected.

An MS will be analyzed for 1 of every 20 samples to measure matrix effects on accuracy. MS samples will consist of additional aliquots of sample spiked with a known amount of analyte. The minimum number of VOCs and metals will be used for spiking the MS in accordance with the Laboratory Technical Specification (BNI 1998a) and Table 3-6; all analytes will be spiked for other inorganic analyses when appropriate. If a valid spike recovery is outside acceptance limits, but the LCS is in control, matrix interference may be indicated. Acceptance limits for MS samples listed in Table 3-6 will be used.

An MD or an MSD will be analyzed for 1 of every 20 samples for inorganics and organics, respectively, to measure precision. For any batch of samples that does not contain a duplicate or MSD, two LCS samples (LCS and LCS duplicate) will be separately prepared and analyzed. If the RPD does not meet the required acceptance limits, the problem will be investigated and corrected. Acceptance limits for precision in Table 3-6 will be used.

Surrogate spikes will be added to all samples for organic analyses (as applicable) to measure sample-specific accuracy. The minimum number of surrogates for each parameter and the corresponding acceptance limits are listed in Table 3-6.

6.8 DATA CALCULATION AND REPORTING UNITS

Calculations of results will be documented in the laboratory SOPs and must be consistent with the reference method. Reporting units will be consistent with applicable regulatory and decision thresholds.

6.9 DOCUMENTATION AND DELIVERABLES

Requirements for hard copy and electronic data deliverables are detailed in the Laboratory Technical Specifications (BNI 1995, 1998a). Electronic deliverables to be loaded into the Bechtel Environmental Integrated Data Management System will also be submitted.

The laboratory is responsible for maintaining supporting documentation in the form of sample preparation logs, instrument run logs, maintenance logs, standards receipt and preparation logs, instrument printouts, and chromatograms. Calculations should be clearly identified in the sample analysis records or in laboratory SOPs.

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Section 7
DATA QUALITY MANAGEMENT

Data quality management includes data management, data verification and validation, preventive maintenance, data assessment, and corrective actions as described below.

7.1 DATA MANAGEMENT

Project data will consist of various types of information, ranging from field measurements to laboratory analyses. Site data requirements for this project will be governed by the specific type of data and the DQOs. Unique data type combinations will be available to accommodate specific data collection and reporting needs for this project.

Primary data management activities include the establishment of sampling design; collecting, encoding, verifying, and validating data; the performance of QA/QC evaluation of data; and the generation of output. The data management staff shares responsibility for high-quality products with other project personnel.

Data management procedures are established by the CLEAN Program DMP (BNI 1993). Project-specific modifications are incorporated into the project DMP.

7.2 DATA QUALITY ASSESSMENT

The data quality assessment process includes analytical data review by the project chemist, data verification of hard copy and electronic results, independent data validation, and evaluation of overall data in terms of the PARCC criteria. Data evaluation will include an assessment of the results from field QC samples such as field blanks, equipment rinsate blanks, and trip blanks.

7.2.1 Data Review

Data will be reviewed by project staff for internal and external consistency in accordance with CLEAN Program Technical Specification for Data Validation Services (BNI 1998b). Other elements of the data review process, including evaluation of laboratory contaminants and tentatively identified compounds, are discussed in the OMP.

PPs (BNI 2003) for performance, system audits, and corrective action oversight will be used. The CLEAN Program Quality Control Management Plan (BNI 1994) includes the requirements and responsibilities of all CLEAN Program personnel and subcontractors to attain the desired level of quality.

The requirements for performance of analytical laboratory analysis are specified in the subcontract for technical services under which the work is performed. The subcontract specifies deliverables, turnaround time, and performance standards. Receipt of required deliverables will be verified in the course of the contract compliance screening. Each data package will be reviewed against a deliverables requirements checklist prepared based on the subcontract and the project-specific needs. Outstanding items will be resolved before the project is closed.

7.2.2 Data Verification

Field and laboratory data will be managed using manual and electronic systems. Data stored, evaluated, and reported electronically will be subject to 100 percent manual verification against hard copy data reports. Discrepancies will be corrected and documented following the CLEAN Program DMP (BNI 1993).

7.2.3 Data Validation

Laboratory data will be validated in accordance with the CLEAN Program Technical Specification for Data Validation Services (BNI 1998b) by a validation subcontractor, independent of the laboratory. The data validation process consists of a systematic assessment and verification of data quality through independent review. Validation must be performed by individuals who are not associated with the collection and analysis of samples, interpretation of sample data, or with any decision-making process within the scope of the particular investigation. This is accomplished through the use of independent third-party data validation subcontractors. Data validation procedures will be in accordance with U.S. EPA guidance for the CLP, modified as necessary to accommodate non-CLP methods (U.S. EPA 1999).

The terminology for levels of data validation has changed because the previous Naval Energy and Environmental Support Activity guidance (NEESA 1988) has been replaced by the Navy Installation Restoration Chemical Data Quality Manual (NFESC 2000), which does not define levels of data validation. The former Level C data validation process (NEESA 1990) will be referenced as Level III data validation, and the former Level D process (NEESA 1990) will be referenced as Level IV data validation. Level III and Level IV data validation requirements and criteria are described in the Technical Specification for Data Validation Services (BNI 1998b) and the Navy SWDIV Environmental Work Instruction No. 1 (SWDIV 2001b).

Level IV data validation follows the U.S. EPA protocols and CLP criteria set forth in the functional guidelines for evaluating organic and inorganic analyses (U.S. EPA 1994a,b). Calculations are checked for QC samples (e.g., MS/MSD and LCS data) and routine field samples (including field duplicates, field and equipment rinsate blanks, and VOC trip blanks). To assure that detection limit and data values are appropriate, an evaluation is made of instrument performance, method of calibration, and the original data for calibration standards.

For a Level III data validation effort, the data values for routine and QC samples are generally assumed to be correctly reported by the laboratory. Data quality is assessed by comparing the QC parameters listed above to the appropriate criteria (or limits) as specified in the project QAPP, by CLP requirements, or by method-specific requirements (e.g., CLP, SW-846).

The fixed-base laboratory data will be subjected to a data validation strategy appropriate to the intended use of the data.

An independent third-party subcontractor will perform a Level III data validation on 90 percent of the fixed-base laboratory data. The remaining 10 percent of the data will receive a Level IV data validation. The sample data that receive Level IV validation will be selected randomly to obtain a representative data set unless a review of the first round of sampling data suggests focused data validation of specific parameters or specific sample locations.

Field measurement results will be reviewed as appropriate to the project DQOs and analytical data measurement objectives.

7.2.4 PARCC Criteria Evaluation

The data quality assessment process encompasses data validation and internal technical data review to evaluate the entire data set for the project. The assessment should consider each type of data, the relationship to the entire data set, and the adequacy of the data to fulfill the DQOs of the sampling event or project. Data sets are assessed for completeness and compliance to method-specific or project-specific QA/QC requirements, including the results of the independent data validation process. Data validation compares the DQOs to the actual level of data quality obtained through evaluation of the PARCC criteria and other method performance requirements. The assessment process also evaluates data quality in terms of the PARCC criteria and determines data usability for the intended purpose(s). The procedures used to assess data precision, accuracy, and completeness are described below.

7.2.4.1 PRECISION AND ACCURACY

The assessment procedures in this section are designed to review QC data for the three types of controlled samples: spikes, blanks, and duplicates.

Spikes

The procedure for assessing spikes will be as follows:

1. Calculate the percent recovery as shown below for each sample:

   Percent Recovery = $[(t-x)/a] \times 100\%$

   where

   t = total concentration found in the spiked sample
   x = original concentration in sample prior to spiking
   a = actual spike concentration added to the sample

2. Qualitatively evaluate the significance of data that fall outside the recovery limits along with associated sample data (per data validation process).

Blanks

The evaluation procedure for blanks may involve a qualitative review of the chemical analysis data reported by the laboratory. The procedure for assessing blank samples will be as follows:

1. If chemicals are detected in blank samples, the laboratory will determine the nature and source of the contamination problem.
2. If any chemicals are found in blank samples, the compound(s) and concentration(s) detected will be reported, and the data will be assessed for potential misinterpretation or high bias (per the data validation process).

Laboratory method blank data will be quantitatively evaluated during the data validation process. Field blank data will be evaluated using the Risk Assessment Guidance for Superfund (U.S. EPA 1989). This guidance provides specific rules on data evaluation and editing data sets with regard to the presence of laboratory and field-based contamination. Field blanks will be evaluated during the internal data evaluation process, and data qualifiers will be applied where appropriate.

Duplicates

The procedure for assessing duplicate samples will be as follows:

1. Calculate the RPD and percent ratio as shown below for each duplicate pair:

   RPD = $[(x_1-x_2)/x_a] \times 100\%$

   where

   x_1 = concentration of sample 1 of pair
   x_2 = concentration of sample 2 of pair
   x_a = average of sample 1 and sample 2
   Percent Ratio = $(x_1/x_2) \times 100\%$

2. Compare the RPDs with the precision objectives in Section 3 and identify any duplicates that do not meet the precision objectives.

7.2.4.2 COMPLETENESS

The completeness of the data consists of an estimate of the amount of data expected from the field program versus the amount of data actually entered into the database that is available for interpretation. The data validation process and data quality assessment will determine which data will not be usable as a result of being rejected. Rejected data will not be eliminated from the database; however, valid data must constitute 95 percent of the total data collected. The procedure for assessing completeness will be as follows:

Percent complete (%C) = $(v/t) \times 100\%$

where

v = number of valid measurements
t = total number of planned measurements

7.3 CORRECTIVE ACTIONS

If QA/QC audits or reviews of data indicate unacceptable data, samples should be reanalyzed if holding-time criteria permit. Should the requirements not be met following reanalysis, the Laboratory Services Supervisor will be responsible for developing and initiating corrective action. The Quality Manager will be responsible for assessing whether the selected corrective action is adequate.

Corrective action may include reanalyzing samples (if holding-time criteria permit); resampling and analyzing; evaluating and amending established sampling and analytical procedures; or reevaluating DQOs and data validation requirements.

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Section 8
QUALITY ASSURANCE OVERSIGHT

Quality assurance oversight, management for performance and system audits, and corrective action performance will follow the CLEAN Program Quality Control Management Plan (BNI 1994), or its equivalent. The Quality Control Management Plan provides the requirements and responsibilities that will be carried out by all personnel and subcontractors to attain the designed level of quality. Personnel are to be qualified and trained in the work that they are assigned.

Navy or city of Tustin personnel will evaluate compliance of the laboratory QA program and procedures with NFESC requirements, or their equivalents, in the Navy Installation Restoration Chemical Data Quality Manual (NFESC 2000). Oversight will include internal and external audits, documentation of findings, and reports of corrective action.

8.1 PERFORMANCE AND SYSTEM AUDITS

Audits and surveillance of activities will be conducted to assure that work is accomplished by trained personnel using approved procedures. These verification activities will be conducted by the Quality Manager, assisted by various technical experts who are not directly responsible for accomplishing the work being reviewed. Audits of field sampling activities, laboratories, and administrative activities will be conducted. Analytical laboratories will be audited annually (approximately) by BEI or the DON following the NFESC process, and reports will be provided to BEI and the DON management. Verification will be conducted to evaluate activities such as sample location identification and control, following chain-of-custody protocol, preparation of field documentation, and calibration of instruments. Verification activities may be scheduled or unscheduled, and will be conducted commensurate and in coordination with work activities.

8.2 CORRECTIVE ACTIONS

Corrective actions will be identified, tracked, and closed out in a timely manner. Project activities that are found to be in noncompliance with quality requirements and cannot be resolved in the normal course of verification activities will be appropriately documented in accordance with approved procedures. Corrective Action Requests will be used to document noncompliance, corrective action commitments, and resolutions.

Corrective action is not complete until the problem has been solved effectively and permanently. Follow-up action to assure that the problem remains corrected is an important step in the corrective action process.

8.3 QUALITY ASSURANCE REPORTS TO MANAGEMENT

QA reports will be made to the program management on a periodic basis. These reports will contain a discussion of the current status of the project, including the results of performance and system audits, the results of any data quality assessments, any problems, and methods to resolve these problems. In addition, the data quality assessment results for the project shall be summarized and reported in the QA section of the groundwater monitoring reports.

8.4 QAPP IMPLEMENTATION

The designated Quality Manager will assist the QAO in the documentation of QAPP implementation. Documentation will provide evidence of compliance with specific QA activities required by this QAPP, such as conducting field and laboratory audits.

8.5 QAPP REVISION OR AMENDMENT

When circumstances arise such as a significant change in work scope that impact the original project DQOs, the QAPP document will be revised or amended. The modification process will be based on U.S. EPA guidelines and direction from the Navy RPM and QAO.

Section 9
REFERENCES

Bechtel National, Inc. 1993. CLEAN Program Data Management Plan. September.

———. 1994. CLEAN Program Quality Control Management Plan. 15 March.

———. 1995. CLEAN II Program Technical Specification for Soil Gas Monitoring, Contract Technical Specifications, 22214-TS-003, Revision 4. June (or latest revision in effect at the time of data review).

———. 1998a. CLEAN Program Technical Specification for Analytical Laboratory Services, Contract Technical Specifications, 22214-TS-002, Revision 5. 25 March (or latest revision in effect at the time of analysis).

———. 1998b. CLEAN Program Technical Specification for Data Validation Services, Contract Technical Specifications, 22214-TS-004, Revision 3. December (or latest revision in effect at the time of data review).

———. 1999. Draft Final Work Plan Potential Landfill Gas Migration Evaluation, Operable Unit-3, Marine Corps Air Facility Tustin, Orange County, California.

_____. 2001. Addendum No. 3 to the Draft Final Interim Basewide Groundwater Monitoring Plan for Ongoing Monitoring, Marine Corps Air Station, Tustin, California.

———. 2002a. Draft Final Remedial Implementation Plan, Operable Unit-3, Marine Corps Air Station Tustin, Orange County, California. July.

———. 2002b. Draft 2001 Annual Groundwater Monitoring Report, Marine Corps Air Station, Tustin, California.

———. 2003. Navy CLEAN Program Procedures Manual. Latest revision.

BNI. *See* Bechtel National, Inc.

Jacobs Engineering Group Inc. 1993. Marine Corps Air Station Tustin, California, Final Site Inspection Report. Prepared for Southwest Division Naval Facilities Engineering Command.

JEG. *See* Jacobs Engineering Group Inc.

Naval Energy and Environmental Support Activity. 1988. Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program. NEESA 20.2-047B. June.

———. 1990. Quality Assurance in Environmental Analysis. Prepared for NEESA by the Analytical Support Group, Sampling and Environmental Support Department, Martin Marietta Energy Systems, Inc. October.

Naval Facilities Engineering Service Center. 2000. Navy Installation Restoration Chemical Data Quality Manual. October.

NEESA. *See* Naval Energy and Environmental Support Activity.

NFESC. *See* Naval Facilities Engineering Service Center.

Southwest Division Naval Facilities Engineering Command. 2001a. Final Record of Decision/Remedial Action Plan, Operable Unit-3, Moffett Trenches and Crash Crew Burn Pits Site, Marine Corps Air Station Tustin, California. December.

———. 2001b. Environmental Work Instruction No. 1. December.

SWDIV. *See* Southwest Division Naval Facilities Engineering Command.

United States Environmental Protection Agency. 1989. U.S. EPA Region IX Guidance for Preparing Quality Assurance Project Plans for Superfund Remedial Projects. 9QA-03-89. September.

———. 1991. User's Guide to the Contract Laboratory Program. Office of Emergency and Remedial Response. EPA/540/P-91/002. January.

———. 1992. Sampler's Guide for the Contract Laboratory Program, First Edition. Office of Solid Waste and Emergency Response. December.

———. 1994a. Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analysis. Hazardous Site Evaluation Division, U.S. EPA, prepared by U.S. EPA Data Review Work Group. 01 February.

———. 1994b. U.S. EPA Contract Laboratory Program, Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration, ILM03.0. December.

———. 1999. Laboratory Data Validation Functional Guidelines for Evaluating Organics Analysis. Hazardous Site Evaluation Division, U.S. EPA, prepared by U.S. EPA Data Review Work Group.

———. 2000. Guidance for the Data Quality Objectives Process. EPA QA/G-4. August.

———. 2001. EPA Requirements for Quality Assurance Project Plan. EPA QA/R-5. March.

U.S. EPA. *See* United States Environmental Protection Agency.

APPENDIX A

RWQCB LOS ANGELES REGION
SOIL GAS GUIDELINES

STATE OF CALIFORNIA
California Regional Water Quality Control Board
Los Angeles Region

INTERIM GUIDANCE FOR ACTIVE SOIL GAS INVESTIGATION
(February 25, 1997)

Introduction

Volatile organic compounds (VOCs) within the unsaturated zone partition into the adsorbed, dissolved, free liquid, and vapor phases. Measurement of VOCs through an active soil gas investigation allows: 1) evaluation of whether waste discharges of VOCs have occurred which may impact groundwater, 2) determination of spatial pattern and extent of vapor phase soil contamination, 3) establishment of vapor distribution for the design of soil vapor extraction (SVE) system, and 4) determination of the efficiency of reduction in threat to groundwater from any cleanup action, including SVE. The work plan should include, but not be limited to, the following:

1.0 Survey Design

1.1
Provide a scaled facility map depicting potential sources and proposed sampling points. Include locations and coordinates of identifiable geographic landmarks (e.g., street center-line, benchmark, street intersection, wells, north arrow, property line).

1.2
Locate initial sampling points in potential source areas and areas with known soil contamination using an adjustable 10 to 20 foot grid pattern. Provide rationale for the number, location and depth of sampling points. Screen the remainder of the site with a 100-foot or less grid pattern.

1.3
Conduct a close interval (10 to 20 foot grid pattern) and multi-level sampling (5 to 10 feet vertical distance between points) in areas with known or relatively high VOC concentrations.

1.4
Use an on-site mobile laboratory with laboratory-grade certifiable instrumentation and procedures for real-time analysis of individual VOCs. Non-specific portable organic vapor analyzers and/or GC-based handheld detectors may not be used for analysis except for daily or weekly vapor monitoring during SVE.

1.5
Maintain flexibility in the sampling plan such that field modifications (grid pattern density, location and depth) can be made as real-time evaluation of analytical test results occurs. Include in the work plan decision-making criteria for these adjustments and explain decisions in the report. Field decisions shall be made in consultation with Regional Board staff.

1.6
Re-sample at any sampling point if anomalous data (i.e., 2 to 3 orders of magnitude difference from surrounding samples) are obtained. Board staff may require additional points to resolve the spatial distribution of the contaminants within the interval in question.

2.0 Sample Collection

2.1
Obtain samples at an adequate depth (nominally 5 feet) below ground surface (bgs) to minimize potential dilution by ambient air.

2.2
Conduct a site-specific purge volume versus contaminant concentration test at the start of the initial soil gas survey and vapor monitoring well sampling. The purpose of the test is to purge ambient air in the sampling system with minimal disturbance of soil gas around the probe tip. Conduct this test based on soil type and where VOC concentrations are suspected to be highest. Describe specific method and equipment to determine optimal purge rates and volumes. Take into account the potential sorption of target compounds to the tubing and adjust the purge rate and time to achieve the optimal purge volume. Limit the sampling vacuum to collect proper samples. Optimum purge volume may be compound specific. "Lighter" early eluting VOCs, such as vinyl chloride, may reach their highest concentration with less purging than "heavier" late eluting VOCs like PCE. Therefore, optimize the purge volume for the compound(s) of greatest concern.

2.3
Explain the expected zone of influence for sample points, taking into consideration soil types, land cover, drive point construction and sample purge rate/time/volume. The vertical zone of influence for purging and sampling must not intersect the ground surface.

2.4
Discuss soil gas sample collection and handling procedures. Discuss the procedures to prevent collection of samples under partial vacuum and the methods to minimize equipment cross-contamination between sampling points.

2.5
Avoid making a pilot hole (e.g., using a slam bar) prior to inserting the probe rod, except to drill through asphalt or concrete. The process of making a pilot hole may promote vapor contaminant aeration and result in lower sample concentration.

2.6
Specify that the sampling equipment (e.g., gas tight syringe, sorbent trap) will not compromise the integrity of the samples. Tedlar bags may only be used for qualitative analysis.

2.7
Assure that the probe tip, probe and probe connectors have the same diameter to provide a good seal between the formation and the sampling assembly. If a space develops between the probe and the formation, as a result of probe advancement, seal (e.g., with bentonite) the area around the probe at the surface to minimize the potential for ambient air intrusion.

2.8
Some sampling systems (e.g., Geoprobe) utilize the probe rod as a conduit for the tubing that connects to the probe tip. Assure a tight fit between the tubing and probe tip to minimize potential for leakage and dilution of the sample.

2.9
Follow the sampling method specified in the soil gas consultant's standard operating procedure (SOP). Discuss with Board staff any deviations from the SOP before it is implemented in the field.

3.0 Laboratory Analysis of Soil Gas Samples

3.1 Primary Target Compounds

1. Carbon tetrachloride
2. Chloroethane
3. Chloroform
4. 1,1-Dichloroethane
5. 1,2-Dichloroethane
6. 1,1-Dichloroethene
7. cis-1,2-Dichloroethene
8. trans-1,2-Dichloroethene
9. Dichloromethane (methylene chloride)
10. Tetrachloroethene
11. 1,1,1,2-Tetrachloroethane
12. 1,1,2,2-Tetrachloroethane
13. 1,1,1-Trichloroethane
14. 1,1,2-Trichloroethane
15. Trichloroethene
16. Vinyl chloride
17. Benzene
18. Toluene
19. Ethylbenzene
20. Xylenes
21. Trichlorofluoromethane (Freon 11)
22. Dichlorodifluoromethane (Freon 12)
23. 1,1,2-Trichloro-trifluoroethane (Freon 113)

3.2 Other Target Compounds

Analyze for other VOCs (e.g., methyl ethyl ketone, methyl isobutyl ketone, ethylene dibromide, petroleum hydrocarbons, etc.) based upon site history and conditions.

3.3 Detection Limit (DL)

Attain a DL of not more than 1 µg/L for all target compounds. A higher DL is acceptable only for the compound(s) whose concentration exceeds the initial calibration range.

3.4 Detectors

Use the following detectors in appropriate combinations:

Electrolytic conductivity detector (ELCD) (e.g., Hall)
Photoionization detector (PID)
Flame ionization detector (FID)
Mass spectrometer (MS)
Electron capture detector (ECD)

3.5.0 Identification of Calibration Standards & Laboratory Control Sample (LCS)

3.5.1
Properly and clearly identify all calibration standards and LCS. The identification must agree with the data on record for the standards and LCS.

3.5.2
Prepare LCS from a second source standard that is totally independent from the standards used for the initial calibration. Second source means a different supplier (whenever possible) or a different lot from the same supplier.

3.6.0 GC Conditions

3.6.1
Use a type of column that can separate all the target compounds. Coelution of the target compounds is not acceptable unless the compounds are distinguished and quantified by two different types of detectors in use at that time.

3.6.2
Analyze the initial calibration and daily mid-point calibration check standards, LCS, blank, and samples using the same GC conditions (i.e., detector, temperature program, etc.)

3.6.3
Use a GC run time that is long enough to identify and quantify all the target compounds.

3.7.0 **Initial Calibration** (Record in Table 1)

3.7.1
Perform an initial calibration:

1 for all 23 compounds listed in Section 3.1;
2 when the GC column type is changed;
3. when the GC operating conditions have changed;
4. when the daily mid-point calibration check cannot meet the requirement in Section 3.8.3; and
5. when specified by Regional Board staff based on the scope and nature of the investigation.

3.7.2
Include at least three different concentrations of the standard in the initial calibration, with the lowest one not exceeding 5 times the DL for each compound.

3.7.3
Calculate the response factor (RF) for each compound and calibration concentration prior to analyzing any site samples. Calculate the average RF for each compound. The percent relative standard deviation (%RSD) for each target compound must not exceed 20% except for the following compounds which must not exceed 30%:

Trichlorofluoromethane (Freon 11)
Dichlorodifluoromethane (Freon 12)
Trichlorotrifluoromethane (Freon 113)
Chloroethane
Vinyl chloride

3.7.4
Verify the true concentration of the standard solutions used with the LCS after each initial calibration. Conduct the verification using a LCS with a mid-point concentration within the initial calibration range. The LCS must include all the target compounds. The RF of each compound must be within ±15% difference from the initial calibration, except for freon 11, 12 and 113, chloroethane, and vinyl chloride which must be within ±25% difference from the initial calibration.

3.8.0 **Daily Mid-point Calibration Check** (Record in Table 1)

3.8.1
Check the calibration using the calibration standard solution with a mid-point concentration within the linear range of the initial calibration before any sample is analyzed.

3.8.2
Include in the daily mid-point calibration check standard the following compounds and every compound expected or detected at the site:

1. 1,1-Dichloroethane
2. 1,2-Dichloroethane
3. 1,1-Dichloroethene
4. cis-1,2-Dichloroethene
5. trans-1,2-Dichloroethene
6. Tetrachloroethene
7. 1,1,1-Trichloroethane
8. 1,1,2-Trichloroethane
9. Trichloroethene
10. Benzene
11. Toluene
12. Xylenes

3.8.3
Assure that the RF of each compound (except for freons 11, 12 and 113, chloroethane, and vinyl chloride) is within ±15% difference from the initial calibration's average RF. The RF for freons 11, 12 and 113, chloroethane, and vinyl chloride must be within ±25%.

3.9.0 **Blank**

3.9.1
Analyze field blank(s) to detect any possible interference from ambient air.

3.9.2
Investigate and determine the source(s) and resolve any laboratory contamination problem prior to analyzing any samples if the blank shows a measurable amount (≥1 μg/L) of the target compound(s).

3.10.0 **Sample Analysis**

3.10.1
Assure that the requirements for initial calibration, daily mid-point check, blank, and LCS are met before any site samples are analyzed

3.10.2
Analyze samples within 30 minutes after collection to minimize VOC loss. Longer holding time may be

allowed if the laboratory uses a special sampling equipment (e.g., sorbent trap, glass bulb) and demonstrates that the holding time can exceed 30 minutes with no decrease in results.

3.10.3
Assure that the concentrations of constituent(s) in a sample do not exceed 50% of the highest concentration in the calibration range. Reanalyze the sample using a smaller volume or dilution if the detected concentration exceed 50% of the highest concentration in the calibration range.

3.10.4
Attain DL of not more than 1 µg/L for all target compounds. If lesser sample volumes or dilutions are used to off-set possible high concentration of constituents in the initial run, use the initial run to calculate the results for constituents that are not affected by the high concentration so that DL of 1 µg/L for these compounds can be achieved.

3.10.5
Quantify sample results using the average RF from the most recent initial calibration.

3.10.6
Add surrogate compounds to all samples. Assure that the surrogate compound concentration is within the initial calibration range. Two to three different surrogate compounds [one aromatic hydrocarbon and two chlorinated compounds (early and middle eluting, except gases)] should be used to cover the different temperature programming range for each GC run.

3.10.7
Calculate the surrogate recovery for each GC run. Surrogate recovery must not exceed ±25% difference from the true concentration of the surrogate, as the sample result would be considered questionable and may be rejected by this Regional Board.

3.11.0 Compound Confirmation

3.11.1
Conduct compound confirmation by GC/MS whenever possible. Use second column confirmation with surrogate for compound confirmation if GC/MS is not used.

3.11.2
Add surrogate compounds to standards and site samples for second column confirmation to monitor the relative retention time (RRT) shift between GC runs. This is required for better compound identification when ELCD, PID, ECD, and FID are used for analysis.

3.11.3
Usually one sample is adequate and quantitation is not required for second column confirmation. Second column confirmation can be done with a different GC. The representative sample can be collected in Tedlar bag and confirmation can be done off site.

3.11.4
~~Second column confirmation is not necessary if the~~ compounds present have been confirmed from previous soil gas investigations.

3.12.0 Samples with High Concentration

3.12.1
DL may be raised above 1 µg/L for compounds with high results (i.e., the limit as specified in Section 3.10.3) and those closely eluting compounds for which quantitation may be interfered by the high concentrations

3.12.2
Quantify sample results according to Section 3.10.4 for analytes which are not affected by the high concentration compounds.

3.12.3
If high VOC concentration in an area is known from previous soil gas analysis, Sections 3.12.1 and 3.12.2 are not necessary when analyzing samples from the area in question.

3.12.4
When dilution with ambient air is used for samples with high results, dilute and analyze in duplicate each day at least one sample to verify the dilution procedure. Ambient air should be checked periodically during each day of analysis.

3.13.0 Shortened Analysis Time

3.13.1
Shorten the GC run time under the following conditions only:

1. The exact number and identification of compounds are known from previous soil and soil gas investigations; and

2. The consultant has been given permission by Regional Board staff to analyze only for specific compounds.

3.13.2
Meet the following requirements when shortening GC run-time:

1. Regional Board staff must approved the shortened run time;

2. The compounds must not coelute;

3 Perform initial calibration and daily mid-point calibration check and analyze LCS and samples under the same conditions as the shorter GC run-time;

4. Quantitate using the average RF from the initial calibration utilizing the shorter run-time; and

5. Perform a normal run-time analysis whenever peaks are detected within retention time windows where coelution, as indicated by the calibration chromatograms, is likely.

3.14.0 Last GC Test Run Per Day of Analysis (Record in Table 1)

3.14.1
A LCS as the last GC run of the day is not mandatory, except under conditions in Section 3 14.2. Include the same compounds used in the daily mid-point calibration check analysis, as listed in Section 3.8 2. Attain RF for each compound within ±20% difference from the initial calibration's average RF, except for freons 11, 12, 113, chloroethane, and vinyl chloride which must be within ±30%.

3.14.2
Analyze a LCS at the detection limit concentration instead of the mid-point concentration if all samples from same day of analysis show non-detect (ND) results. The recovery for each compound must be at least 50%. If it is less than 50% all the ND results of the samples become questionable

3.15.0 On-site Evaluation Check Sample

3.15.1
Analyze on-site the evaluation check sample as part of the QA/QC procedures when presented with such a check sample by Regional Board staff. Provide preliminary results on-site.

3.15.2
If the results show that the soil gas consultant has problems with the analysis, all the results generated during the same day may be rejected. Correct all problems before any more samples are analyzed.

3.16.0 Site Inspection

3.16.1
Unannounced, on-site inspection by Regional Board staff is routine. Provide upon request hard copies of the complete laboratory data, including raw data for initial calibration, daily mid-point check, LCS and blank results. Failure to allow such inspection or to present these records or field data may result in rejection of all sample results.

3.16.2
The soil gas consultant must understand the instruments, analytical and QA/QC procedures and must be capable of responding to reasonable inquiries.

3.17.0 Recordkeeping in the Mobile Laboratory

Maintain the following records in the mobile laboratory:

1. A hard copy record of calibration standards and LCS with the following information:

   a. Date of receipt
   b. Name of supplier
   c. Lot number
   d. Date of preparation for intermediate standards (dilution from the stock or concentrated solution from supplier)
   e. ID number or other identification data
   f. Name of person who performed the dilution
   g. Volume of concentrated solution taken for dilution
   h. Final volume after dilution
   i. Calculated concentration after dilution

2. A hard copy of each initial calibration for each instrument used for the past few months.

3. The laboratory standard operating procedures

4.0 Reporting of Soil Gas Sample Results and QA/QC Data (Record in Table 1 and 2)

4.1
Report all sample test results and QA/QC data using the reporting formats in Appendix A. Compounds may be listed by retention time or in alphabetical order. Include in the table of sample results all compounds in the analyte list. Report unidentified or tentatively identified peaks. Submit upon request all data in electronic format and raw data, including the chromatograms. Identify the source(s) of the contaminants detected in the investigation, as indicated by the data.

4.2
Report the following for all calibration standards, LCS and environmental samples:

1. Site name
2. Laboratory name
3. Date of analysis
4. Name of analyst
5. Instrument identification
6. Normal injection volume
7. Injection time
8. Any special analytical conditions/remark

4.3
Provide additional information, as specified, for different types of analyses. Tabulate and present in a clear legible format all information according to the following grouping:

1. Initial calibration

   a. Source of standard (**STD LOT ID NO.**)
   b. Detector for quantitation (**DETECTOR**)
   c. Retention time (**RT**)
   d. Standard mass or concentration (**MASS/CONC**)
   e. Peak area (**AREA**)
   f. Response factor (**RF**)
   g. Average response factor (**RF_{ave}**)
   h. Standard deviation (**SD_{n-1}**) of RF, i.e.,

$$\left[\sum_{i=1}^{n} (RF_{ave} - RF_i)^2 / (n-1)\right]^{½}$$

n = number of points in initial calibration

   i. Percent relative standard deviation (**% RSD**), i.e., $(SD_{n-1} / RF_{ave}) \times 100$ (%)
   j. Acceptable range of %RSD (**ACC RGE**)

2. Daily calibration check sample

   a. Source of standard
   b. Detector
   c. Retention time (RT)
   d. Standard mass or concentration
   e. Peak area
   f. Response factor (RF)
   g. Percent difference between RF and RF_{ave} from initial calibration (**% DIFF**)
   h. Acceptable range of %DIFF (**ACC RGE**)

3. LCS. Same format as daily calibration

4. Environmental sample

   a. Sample identification
   b. Sampling depth
   c. Purge volume
   d. Vacuum pressure
   e. Sampling time
   f. Injection time
   g. Injection volume
   h. Dilution factor (or concentration factor if trap is used)
   i. Detector for quantitation
   j. Retention time (RT)
   k. Peak area
   l. Concentration in µg/L (**CONC**)
   m. Total number of peaks found by each detector
   n. Unidentified peaks and/or other analytical remarks

5. Surrogate and second column confirmation

   Mark RT and compound name on: a) second column chromatogram of standard and b) second column chromatogram of confirmation sample.

4.4
Discuss the method(s) to be used for data interpolation (contouring). Provide isoconcentration maps for each VOC detected, total chlorinated volatile organics, total aromatic hydrocarbons, and petroleum-based hydrocarbons for each sampling depth, as applicable. Provide cross-section(s) depicting the geology and changes in contaminant concentration with depth, as justified by the data.

5.0 Companion Soil Sampling

5.1
Discuss soil boring locations with Regional Board staff. Locate borings and sampling depths based on all available information including soil gas test results.

5.2
Conduct the soil sampling and analysis per this Regional Board's **Well Investigation Program General Requirements for Subsurface Investigations, Requirements for Subsurface Soil Investigation** and **Laboratory Requirements for Soil and Water Sample Analyses.**

6.0 Soil Vapor Monitoring Well/Vertical Profiling

Install soil vapor monitoring wells for vertical profiling in areas where significant VOC concentrations were identified during the vapor investigation. The objectives of vertical profiling are to: 1) assess the vertical distribution of VOCs in the vapor phase within the unsaturated zone, 2) determine the spatial pattern of vapor phase soil contamination at different depths within the unsaturated zone, 3) identify migration pathways at depth along which VOCs may have migrated from sources, and 4) serve as discrete monitoring points to evaluate the efficiency of a cleanup action. Soil vapor monitoring wells offer the opportunity to resample as many times as necessary to monitor soil vapor changes over time.

Address appropriate items in the following sections when conducting vertical profiling

6.1
Install nested, cluster, and/or multi-port vapor monitoring wells to obtain discrete multi-depth soil vapor data in the unsaturated zone. Provide a schematic diagram of the well design and a cross-section of the site showing the major lithologic units and zones for vapor monitoring

6.2
Collect undisturbed soil samples if fine-grained soils are encountered during drilling of the boring for the probes. Due to air-stripping effect, VOC analysis of soil samples is not acceptable if air drilling method is used. Refer to Section 5.2 for sampling and testing requirements.

6.3
Use all available information (e.g., geologic log, organic vapor concentration reading) to select appropriate depths for vapor monitoring. Install probes at depths with elevated vapor readings (headspace) and/or slightly above fine-grained soils which can retard the migration of VOCs. The deepest probe should be installed above the capillary fringe.

6.4
Consider installing nested vapor probes in the annular space of the groundwater monitoring well to serve as a dual-purpose well if both vapor and groundwater monitoring are required. This design saves costs by installing vapor and groundwater monitoring wells in a single borehole.

6.5
Use small-diameter (e.g., ≤¼-inch) continuous tubing attached from the vapor probe to the ground surface to minimize purge volume.

6.6
Design and construct the vapor wells to serve as long-term monitoring points to evaluate the efficiency of a cleanup action and soil vapor changes over time. Protect the tubing from being damaged or clogged by subsurface soil materials especially in deep installations (e.g., place inside a PVC casing) or consider using ½-inch PVC pipe in place of the tubing. If a tubing is used, consider attaching a weight at the probe tip and/or attaching the tubing onto a supporting pipe or rod to ensure that the probe tip remains in-place during installation

Properly cap the top end of each tubing/pipe (e.g., control valve) and label each tubing/pipe with the correct sampling depth

6.7
Attach the bottom-end of the tubing to an appropriate vapor probe (e.g., PVC screen, stainless steel wire screen, stainless steel probe, or brass elbow, etc). If a vacuum pump is used for purging and sampling, include a wire screen around the probe to prevent soil particles from blocking the probe's airways. Ensure that the connection between the tubing and the vapor probe is tight to prevent leakage

6.8
Place the filter pack (e.g., sand or pea gravel) around each vapor probe and isolate each monitoring zone with bentonite seals. Use an appropriate method (e.g., tremie method) to avoid bridging or segregation during placement of the filter packs and bentonite seals.

Extend the filter pack to a sufficient distance above the probe to allow for settling of backfill materials. In general, the filter pack should not exceed 3 feet in thickness. In deep borings, the filter pack should extend about four feet above the probe to allow for settling of backfill materials and to reduce the potential for the bentonite seal settling around the probe.

Consider placing fine sand above the filter pack to prevent the bentonite seal from entering the filter pack. Place a minimum of two feet thick bentonite seal above and below the filter pack. Allow sufficient time (e.g., one-half to one hour) for bentonite seal to properly hydrate before placing filter pack or cement-based sealing materials.

6.9
Prevent infiltration of surface runoff and unauthorized access (e.g., use a locking subsurface utility vault).

6.10
Specify the schedule for sampling the vapor probes. In general, soil vapor monitoring is required a minimum of one and two months after installation. Due to the VOC stripping caused by air drilling methods, conduct soil vapor monitoring at least two and four months following well completion. Regional Board staff may require a different sampling schedule and additional sampling based upon site conditions and test results.

6.11
Specify the procedures to properly decommission vapor wells that are no longer needed. The decommissioning activity should achieve an effective and long-term seal of subsurface geologic materials

and prevent cross contamination in the subsurface.

7.0 Soil Gas Consultants

This Regional Board reserves the authority to review any soil gas consultant's work to assure compliance with all applicable statutes, regulations, orders, and guidelines. It is your responsibility to ascertain that the individual directing the field investigation is professionally qualified and conducts the field work in accordance with the Board's guidance for active soil gas investigations.

Acknowledgements

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ATTACHMENT C

DATA MANAGEMENT PLAN

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway
San Diego, California 92132-5190

Contract No. N68711-95-D-7526

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

CLEAN 3

FINAL
DATA MANAGEMENT PLAN
OPERATION AND MAINTENANCE PLAN
OPERABLE UNIT 3
MARINE CORPS AIR STATION TUSTIN
ORANGE COUNTY, CALIFORNIA

CTO-0045/0030
May 2003

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Toni Kuzmack, Database Supervisor

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ACRONYMS/ABBREVIATIONS

BEIDMS	Bechtel Environmental Integrated Data Management System
BNI	Bechtel National, Inc.
CCS	contract compliance screening
CEG	(California) Certified Engineering Geologist
CLEAN	Comprehensive Long-Term Environmental Action Navy
CONDOR	CONtrolled DOcument Register
CTO	contract task order
DMP	data management plan
DQO	data quality objective
EDD	electronic data deliverable
FS	feasibility study
LTM	long-term monitoring
MCAS	Marine Corps Air Station
NEDTS	Navy Environmental Data Transfer Standards
OU	operable unit
PDCC	Program Document Control Center
PP	program procedure
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RI	remedial investigation
SOP	standard operating procedure
SWDIV	Southwest Division Naval Facilities Engineering Command
TS	technical specification
U.S. EPA	United States Environmental Protection Agency

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Section 1
INTRODUCTION

This Data Management Plan (DMP) provides site-specific guidance related to the collection, maintenance, and use of data in support of the long-term groundwater and surface water monitoring to be conducted at Operable Unit (OU)-3, Marine Corps Air Station Tustin, California. This work is being conducted under the Comprehensive Long-Term Environmental Action Navy (CLEAN) 3 Program Contract Task Order (CTO)-0045. Activities to occur at OU-3 are referred to as "the Project"; the entire CLEAN Program is referred to as "the Program."

This DMP is a companion document to the Bechtel National, Inc., Program DMP (BNI 1993). The Program DMP provides guidance for managing Program data such that they are controlled, documented, and retrievable in the format required by the end user. The intent of the Program DMP is to integrate the entire life cycle of environmental data, from planning data collection to archiving data elements, into a logical sequence that addresses all CLEAN data needs. Implementing this Project DMP will result in meeting the data maintenance and access requirements specified in the Program DMP. This DMP emphasizes managing, verifying, and validating data to satisfy the Program data quality objectives (DQOs).

This DMP is a contractor-specific document, specifically prepared for use by Bechtel Environmental, Inc., to meet OU-3 Project and CLEAN 3 Program requirements. In the event that another contractor is selected to implement the long-term monitoring (LTM) program for OU-3, that contractor shall prepare a DMP that will meet specific data requirements described in the Quality Assurance Project Plan (QAPP) (Attachment B). As described in Section 5.5, all attributes and information within the database will be encoded such that transfers of data to the Navy, city of Tustin or property transferees, or to regulatory agencies will be in accordance with the Navy Environmental Data Transfer Standards (NEDTS) format. Spatial data and drawing files will adhere as closely as practical with the Tri Services Spatial Data Standards. Turnover of data will take place at the point of any property transfer, and in the event that contractors selected to implement the LTM program are redesignated.

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Section 2
DATA MANAGEMENT OVERVIEW

The Program data management system is composed of the database itself, the computer hardware and software, the data management protocols, application programs, relevant procedures, and the Data Management staff. Primary data management activities include establishing sampling designs; collecting, encoding, verifying, and validating data; performing quality assurance (QA)/quality control (QC) evaluation of data; and generating output.

Project data will consist of various types, ranging from field measurements (e.g., surveying and characterization of the groundwater) to laboratory analyses. Site data requirements for this Project will be governed by a specific type of data and DQO. Unique data-type combinations will be available to accommodate the specific data collection and reporting needs for this Project. Figure 2-1 shows the typical data life cycle, including stages of sampling plan development, data collection, data analysis, data review, and data use.

Generators of data will follow the QAPP and program procedures (PPs) to assure that collected data adhere to Program environmental data standards. In addition, collected data will be subjected to surveillance by QA/QC personnel and technical review by Project staff. Periodic audits of analytical laboratories will be conducted also, and results will be tracked and documented through the Program Document Control Center (PDCC) to comply with analytical data reporting requirements as specified in CLEAN Technical Specification (TS)-002 (BNI 1998a).

2.1 APPLICABLE PROCEDURES

The following CLEAN PPs discuss database functions and tasks (BNI 2003):

- PP T 2.1, Environmental Database
- PP T 2.2, Sample Information Management System
- PP T 2.3, Sample Analysis Tracking Module
- PP T 2.4, Data Review
- PP T 2.5, Data Analysis for RI/FS
- PP A 1.1, Document Control Records Keeping and Handling

The Program application of the Bechtel Environmental Integrated Data Management System (BEIDMS) is currently running Version 3.5 under Oracle™ Relational Database Management System, Version 8i. PP T 2.1, which includes BEIDMS user manual and data dictionary, will be revised to reflect the current software version whenever upgrades occur.

2.2 DATA MANAGEMENT RESPONSIBILITIES

The Data Management staff shares responsibility for high-quality products with Project management. All stages of data processing—from the design of data collection schemes and definition of DQOs to transmittal of data to the Navy—require that the Project technical and management staffs team with Data Management staff.

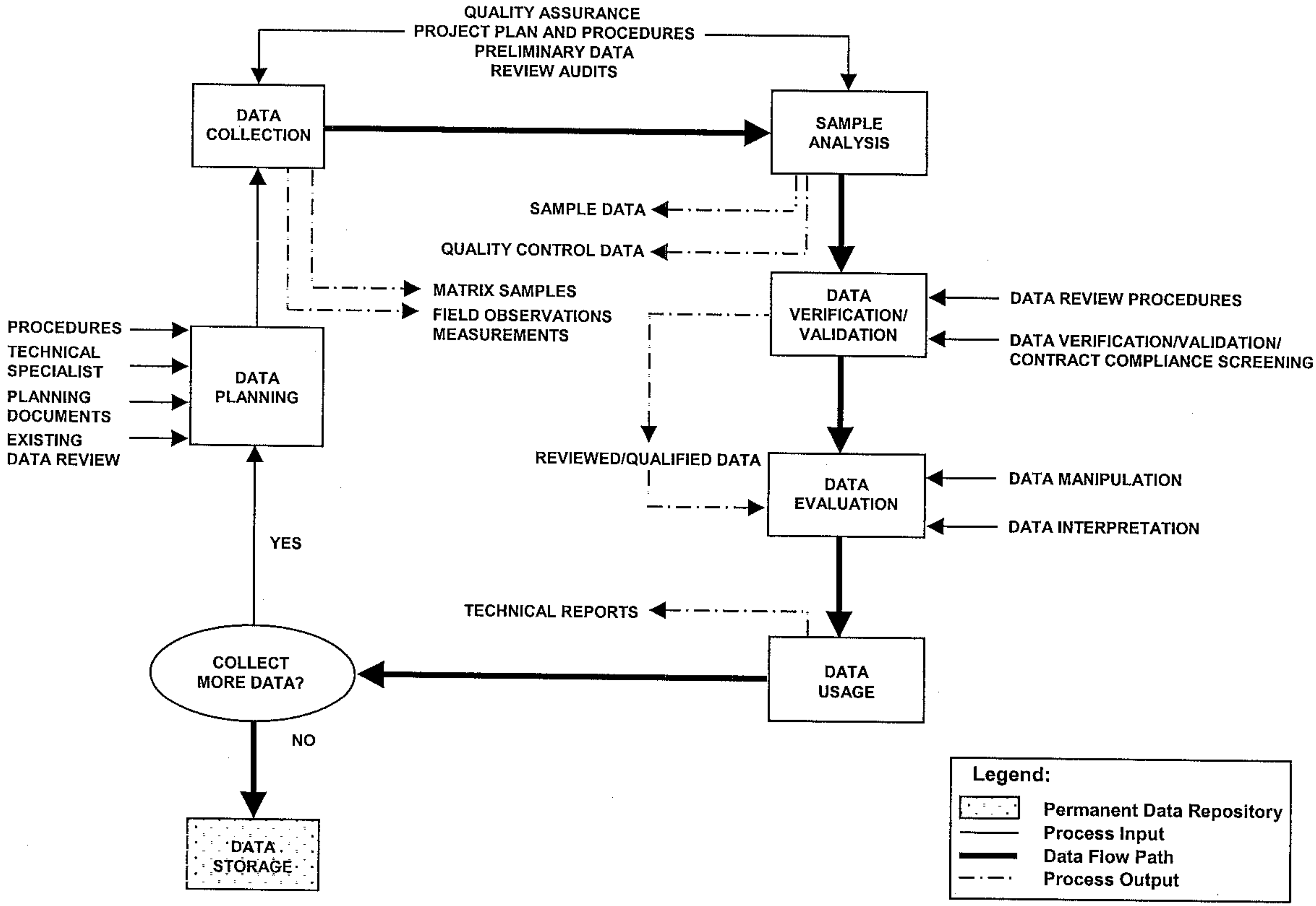

Figure 2-1
Data Life Cycle

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The CTO Leader is responsible for:

- oversight of Project data-gathering activities;
- adherence to Program data management procedures;
- review of field-collected data;
- timely transmission of data to PDCC and the Data Management group; and
- review of hard copy data when they are received from the laboratory, providing a preliminary check on the data value accuracy.

The CLEAN PDCC staff is responsible for accurate and timely entry of data transmittals from field and laboratory sources into the PDCC database (communications control register and supplier document register numbering systems) and for distribution of the appropriately numbered data submittals to the Program Database Supervisor and CTO Leader.

Data Management staff compiles Project data into the Program database, making data readily available to Program and Project personnel; trains data users; develops application interfaces; and provides systems maintenance and data archival services. The Data Management staff is responsible for defining access levels (e.g., read-only, modify, add, and delete privileges) for new users, setting up user accounts (e.g., assigning passwords, allocating directory space, and providing instructions for logging onto the system), and defining user profiles. User profiles include the type of terminal or workstation, user expertise, and application.

The data management system is geared to meet user needs and to respond to deficiencies or new applications, as they become known. Therefore, field and sample collection staff will respond to user feedback and oversee the system in coordination with the Data Management staff. Data Management staff responds to requests from the Navy and assure conformance to the Navy's data management practices.

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Section 3
DATABASE

The database resides in a computer system at the Program San Diego office. The database is maintained using Oracle, a relational database management software system. (See PP T 2.1, Environmental Database, for details on database content, format, and utility.) The database files to be used in this Project are described in the following sections. Table 3-1 lists data tables and information categories used in the CLEAN database; see the Program DMP for descriptions.

3.1 SURVEY DATA

Sample locations have been surveyed by a civil survey subcontractor in the field. The horizontal position of sample locations will be defined relative to the State Plane Coordinate System, North American Datum 1983. Sample location elevations will be defined relative to the North American Vertical Datum 1988. The results will be presented as maps or drawings accurately associated with permanent benchmarks. These maps will be available to Project staff in both hard copy and electronic format.

Sample station location data will be stored in the BEIDMS database. These data will be formatted as described in the Program DMP and NEDTS.

The database table SAMPLE_STATIONS contains the location data for either survey or global positioning system-generated coordinates. This table is used for locations that are referenced to other data assembled in the course of the investigation or to repeated sampling events at the same location.

3.2 HYDROGEOLOGICAL DATA

Well construction and groundwater-level data have been collected. This information must be spatially correlated with other data and, therefore, incorporated into mapping or drawing systems.

First, well construction data were entered into gINT®. This database generates project-standardized well-construction schematics. Then data from gINT were manually entered into BEIDMS and translated into NEDTS format. Water-level measurements will be recorded in the database table WATER_LEVEL_MEASUREMENTS. Well-construction details were recorded in the database table WELLS.

3.3 CHEMICAL ANALYSIS RESULTS

Chemical analysis results include concentrations for classes of compounds, specific compounds, or elements detected in samples by field or laboratory analytical methods. The data are collected for a number of purposes, including safety and health monitoring, selection of samples for analysis, evaluation of contaminant concentrations, waste disposal, and prediction of fate and transport of contaminants. However, the primary purpose of data collection is to evaluate the presence of contaminants and respective concentrations.

Table 3-1
CLEAN Data Tables and Information Categories

Table Type	Table Name
Reference	ANALYTES
Reference	ANALYTE_ALIASES
Reference	ANALYTE_TYPES
Descriptor	BOREHOLES
Tracking	CHAINS_OF_CUSTODY
Reference	COLLECTION_METHODS
Tracking	CONTAINERS
Reference	CONTAINER_TYPES
Reference	CRITERIA
Tracking	DATA_PACKAGES
Tracking	DATA_SOURCES
Descriptor	FACILITIES
Measurement	FIELD_MEASUREMENTS
Measurement	FIELD_RESULTS
Reference	INSTRUMENTS
Descriptor	LITHOLOGY
Tracking	LOG_BOOKS
Reference	MATRICES
Reference	METHODS
Reference	PAY_ITEMS
Reference	PAY_ITEMS_METHODS
Reference	PRESERVATIVES
Reference	QUALIFICATION_CODES
Reference	QUALIFIERS
Reference	QUALITY_LEVELS
Tracking	REQUESTED_ANALYSIS
Measurement	RESULTS
Tracking	RESULT_QUALCODE
Reference	RESULT_TYPES
Measurement	SAMPLES
Descriptor	SAMPLE_STATIONS
Reference	SAMPLE_TYPES
Tracking	SAMPLING_EVENTS

(table continues)

Table 3-1 (continued)

Table Type	Table Name
Descriptor	SITES
Descriptor	STATION_TYPES
Tracking	TRANSFERS
Descriptor	UNITS
Measurement	WATER_LEVEL_MEASUREMENTS
Descriptor	WELLS
Measurement	WELL_CONSTRUCTION

Acronym/Abbreviation:
CLEAN – Comprehensive Long-Term Environmental Action Navy

The chemical data may be characterized as:

- field analysis data,
- field screening data, and/or
- laboratory analysis data

Each data type has a specific purpose reflecting a quality management strategy tailored to data use. This strategy is defined through the DQO process.

3.3.1 Field Analysis Data

Examples of field analysis data include water temperature, dissolved oxygen content, electrical conductivity, field pH measurements, and oxidation reduction potential. Field analysis data are differentiated from screening data by the level of precision and accuracy that can be expected from the procedure. Field analysis data are supported by calibration of the instruments using two or more standards, as well as by continuing calibration verification at frequencies specified in CLEAN PPs and standard operating procedures (SOPs) (BNI 2003). The field analysis results are entered into the FIELD_MEASUREMENTS database table as appropriate. Landfill gas results will be entered into the FIELD_RESULTS database table.

3.3.2 Field Screening Data

Field-screening data are used to direct the course of work; analyses are typically performed using direct-reading instrumentation. Results from field screening are compared to preestablished threshold values. The field staff may collect field-screening data during sampling or safety and health monitoring. The results are recorded in the field logbook along with any related work-process decisions. This documentation is reviewed by appropriate supervisory staff for quality; if appropriate, the data are recorded for future reference in the database table FIELD_MEASUREMENTS.

3.3.3 Laboratory Analysis Data

A large portion of the Project data management support will be associated with laboratory-based analyses. Detailed laboratory procedures will be used as specified in the QAPP. These procedures must be consistent with Program PPs to assure data precision, accuracy, representativeness, completeness, and comparability. To help manage the data and the many contractual and procedural requirements, analytical results will be entered in the database table RESULTS and referenced to several other associated database tables.

Management of sample information will include the use of data collection forms, chain-of-custody forms, sample labels, custody seals, etc., as necessary to follow the procedures outlined in PP T 2.2, Sample Information Management System.

The following will be monitored during fieldwork:

- submittal of samples for laboratory analysis
- schedules associated with sample analyses (including holding times)
- transfer of electronic data deliverables (EDDs) and hard copies from the laboratory
- tracking of data verification and validation

3.4 DATA ENTRY

In general, data will be electronically transferred to the Program database. Electronic data will be transferred using magnetic media (e.g., tapes, diskettes, or storage cartridges). Detailed procedures for transmittal of data are provided in PP T 2.2; PP A 1.1, Document Control Records Keeping and Handling; and various SOPs covering inquiry, collection, and recording of specific data types.

Field sampling data will be manually entered into the Program database. These data will include sampling dates and locations, field screening and analysis measurements, and data qualifiers from the data validation reports. Data will be entered according to appropriate QA and verification requirements.

3.5 GEOGRAPHIC INFORMATION SYSTEM DATA

Cartographic data will include spatial information and descriptions of discrete geographic features (e.g., sampling station locations and contaminant concentration levels) and continuous features (e.g., surface elevation contours). The geographic information system databases for the Program are developed and stored using ArcView™ software, which interfaces with the environmental database via Oracle. In cases where detailed drawings are needed for other purposes (e.g., engineering drawings), computer-assisted drafting software is used.

3.6 STANDARDIZATION

The Program DMP establishes a standard data management process. Thus, data users on each CLEAN project can retrieve data from any investigation knowing that values for given parameters are comparable. Furthermore, the data management software converts variables to standardized units whenever necessary to be consistent with the established formats. Any change to raw data will be documented on a database change request, which will be tracked through PDCC and recorded in the electronic data management system.

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Section 4
DATA REVIEW

Review of laboratory data includes data verification and evaluation; contract compliance screening (CCS); data validation, qualification, and review; and a general assessment of the data. Independent, third-party data validation may also be used to meet project DQOs, as stated in the QAPP. Detailed methodologies for these processes are presented in PPs T 2.4, Data Review, and T 2.5, Data Analysis for RI/FS. Unverified and unvalidated data will be stored in a temporary repository until the appropriate level of data review has been completed.

After data review, corrections will be made and limitations identified. Then the data will be released for use.

4.1 DATA VERIFICATION AND EVALUATION

Data generators will be responsible for data verification and evaluation at each site. The generators may be the lead field investigators or the Project laboratory coordination staff.

Lead field investigators, designated by the Project manager, will collect and verify data (i.e., confirm that database entries match field logbook entries). Verification tasks will be governed by PP T 2.4 and CLEAN SOPs. Verification checklists for each type of collected data will be used and included in the PDCC document tracking system as attachments to the data collection forms and/or EDDs.

Electronic data will be transferred using magnetic media (e.g., tapes, diskettes, or storage cartridges). The transmitter will verify and document that the data on the associated hard copy match the contents of the data file. Any discrepancies will be resolved by a Project technical specialist.

In addition, a qualified professional (designated by the CTO Leader) will evaluate all data (field and laboratory) as soon as they become available. This evaluation confirms the collected data make sense. For example, a water-level measurement collected on a date before mobilization in the field would be questioned, as would a water-quality parameter that is highly inconsistent with what is expected (e.g., when the water in the well is pure—without trace elements).

The integrity of any data modification or input will also be maintained by using standard methods. These methods include rechecking output documents by both the originator of the data and a second checker. At a minimum, the database content must match the raw data exactly as received by Data Management staff and as documented in PDCC. Any necessary changes to data in BEIDMS are tracked both on hard copy (data review/correction forms) and within the database audit function.

4.2 CONTRACT COMPLIANCE SCREENING

Following the verification of analytical data, a CCS will be performed. The CCS will assess the completeness of laboratory deliverables and analytical laboratory subcontractor compliance with specified analytical protocols, QA/QC protocols, and the laboratory's specific subcontract requirements. All Project personnel performing CCS will be completely familiar with the Project data requirements. If there is significant noncompliance with the contract, the review process will stop and the compliance issues will be resolved. Resubmittals of hard copy data packages from the laboratory may be requested.

4.2.1 Completeness Assessment

The completeness assessment will determine whether all required data package deliverables are present (e.g., case narratives, chain-of-custody forms, sample results, required QC information, and raw data). A "laboratory deliverables requirements review checklist" will be completed for each analytical method and filed in PDCC with the associated data packages.

Additionally, the assessment will determine whether the following requirements have been met.

- Results were reported for all samples on the chain-of-custody forms for specified analytical parameters unless laboratory sample discrepancy reports provide adequate explanations for omissions.
- Results were reported for all compounds or analytes within a given analytical method.

4.2.2 Compliance Assessment

The compliance assessment involves determining whether the laboratory has met the following criteria.

- Holding times were met.
- Data were reported in the correct units of measure.
- Correct analytical methods were employed.
- Required QA/QC was performed.
- Reporting forms were completed for all samples submitted; reporting forms were submitted for each reanalysis, dilution, and other laboratory procedure, with all requisite flags and dilution factors; and problems encountered during analysis were documented in the case narratives.
- Complete analyte names were provided in case narratives if the names were truncated by laboratory software.

4.3 DATA VALIDATION, QUALIFICATION, AND REVIEW

Laboratory data packages may be validated by an independent subcontractor, in accordance with CLEAN technical specifications for data review, PP T 2.4, Southwest Division Naval Facilities Engineering Command Environmental Work Instruction No. 1 (SWDIV 2001), and United States Environmental Protection Agency (U.S. EPA) guidelines. Data generated solely for the purposes of remedial design will not be subjected to independent third-party validation. However, the data packages submitted by the laboratory will be kept on file to allow third-party validation later (in the event that the data are applied for alternative uses, such as risk assessment or site closure). Data validation requirements are specified in the QAPP.

Validation of a data package includes:

- identifying data anomalies,
- assessing method compliance,
- assessing calibration frequency and acceptability,
- assessing QC frequency and acceptability, and
- qualifying data to identify data usability limitations.

If applicable, analytical data will be assigned review qualifiers based on data validation. Review qualifiers will be in accordance with the applicable U.S. EPA National Functional Guidelines for Data Validation (U.S. EPA 1994). Laboratory and review qualifiers are fully defined in CLEAN TS-004 (BNI 1998b). Data assigned an "R" qualifier (rejected data) will not be used for any purpose (including, but not limited to, risk assessment, data interpretation, tables, and figures).

Data may be qualified if data reports lacked sufficient supporting information to allow clear interpretation of the data. Analytical data may be further qualified based on contamination reported in associated field blanks in accordance with U.S. EPA risk assessment guidance. Any specified data qualification will be documented in the report.

The usefulness of data for specific purposes will be based on application-related data requirements, methods of collection, and validation flags for analytical results. Data qualification will be fully documented, and data quality will be easily interpreted by referencing qualifier flags within each table. Any specific data qualification that requires further explanation can be documented in comment fields within the database tables.

The data verification and validation processes result in categorizing (flagging) the data according to established classification criteria (e.g., verified, validated, unvalidated, or invalid). These classification categories are determined after technical specialists have reviewed the data. The qualified data considered "acceptable" are accompanied by documentation showing that:

- sample collection followed approved procedures and protocols that were appropriate to yield reliable and reproducible results;
- data reporting included sufficient supporting information to allow clear interpretation of the data; and
- QA/QC procedures were clearly documented and implemented both in the field and in the laboratory.

Unacceptable data are those that do not fulfill these requirements. Insufficient or questionable data will be further documented or supported by collecting more information as required.

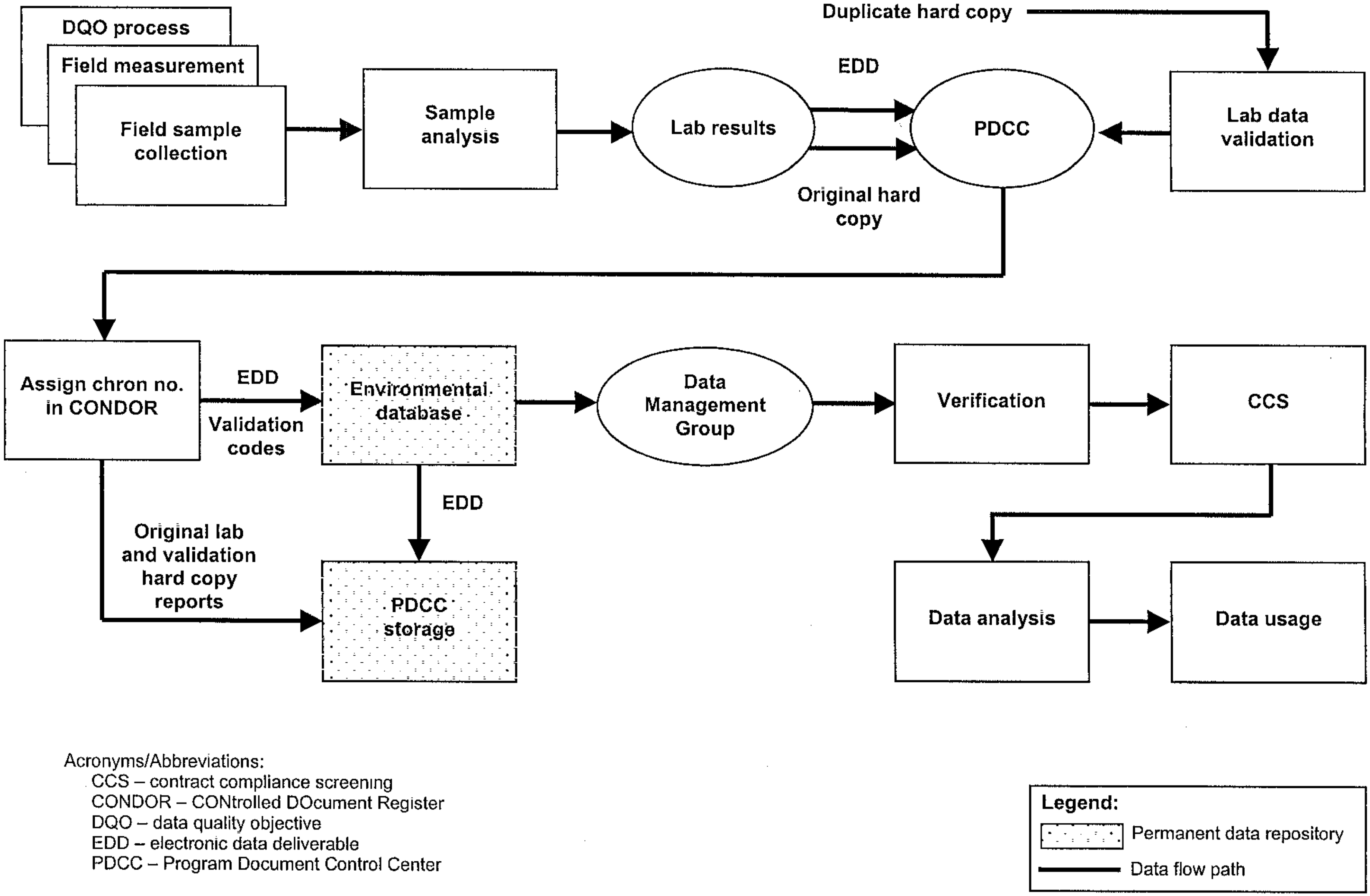
Data will be reviewed in accordance with PP T 2.4 (see Figure 4-1). New data will be verified by assuring that applicable PPs are followed. The data may then be validated as directed in the QAPP. Unverified and unvalidated data will be stored in a temporary repository until the appropriate level of data review has been completed. Specific Project technical personnel will have access to these data for field decision-making purposes and assuring collected data make sense. Once the data review process is completed (including appropriate documentation), corrections are made, and limitations are identified, data will be loaded into the production database and released for use.

4.4 GENERAL ASSESSMENT

The general assessment is an overall evaluation of the data and a summary of data review activities and significant results. In addition to the compliance screening and data verification and validation (if applicable), the data reported from the analysis of the samples will be evaluated to assure that they are of sufficient quality for use in the investigation. Insufficient or questionable data will be further documented or supported by collecting more information as required. Data will be evaluated in accordance with PP T 2.4 (Figure 4-1).

The general assessment will include:

- evaluation of whether sampling objectives were clearly defined and whether sufficient data were collected to meet the DQOs as stated in the Remedial Implementation Plan;
- evaluation of whether data reported from the analysis of the samples are of sufficient quality for use in the Project;
- a summary of the significant results of the laboratory QC samples;
- a summary of the significant results of the field QC samples;
- a summary of the significant data validation findings for all analytical parameters; and
- an assessment of the data based on precision, accuracy, representativeness, completeness, and comparability parameters as defined in the QAPP.



Acronyms/Abbreviations:
CCS – contract compliance screening
CONDOR – CONtrolled DOcument Register
DQO – data quality objective
EDD – electronic data deliverable
PDCC – Program Document Control Center

Figure 4-1
Field Sampling Data Process

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Section 5
DATA ACCESS AND MAINTENANCE

The following subsections discuss data access, documentation, security, backup and recovery, and transfer of data to the Navy.

5.1 DATA ACCESS

The data management system provides direct user access to the verified and validated database tables through customized screens and menus. The Project applications requiring access to these data will include data reporting and statistical evaluations.

Data users assigned to this Project will be able to obtain environmental data reports by requesting specific output from the database tables. Output reports will be developed based on specifications that Project technical staff provide to Data Management staff. More sophisticated data users can perform their own queries to generate Oracle output using the appropriate access program.

5.2 DOCUMENTATION

All data input, procedures, and output (products) will be fully documented and tracked to assure retrievability and provide data users with a library of available data and applications. Detailed documentation procedures are presented in PP T 2.2, Sample Information Management Systems, and PP A 1.1, Document Control Records Keeping and Handling. PP T 2.1, Environmental Database, describes database table variables, data sources, file formats, measurement units, and other attributes that will be needed by data users to generate specific products. For example, Chemical Abstracts Service numbers are in the ANALYTE_ID field, and laboratory QC results are in the ANALYSIS_CODE and ANALYTE_TYPE fields. Specific data requirements associated with laboratory analytical methods employed to measure sample contaminant concentrations, site geologic characteristics, and other reference and descriptive information are presented in the Field Sampling Plan. These data will also be tracked and documented within the data management system.

5.3 SECURITY

Access to Project data will be unlimited to authorized users, but various levels of access will be established and maintained to assure complete data security and integrity. The data management system is designed to protect against unauthorized data access and corruption of data. User access is controlled by the use of passwords, and users will be provided read-only access to data.

Online access to data tables will be granted to users with read-only privileges for specialized applications or for routine report generation. Only Data Management staff will be able to make changes to validated data, and such changes may occur only when database change requests have been submitted through PDCC with authorization signatures from appropriate technical and management staffs.

Oracle offers the following levels of user privileges.

- DBA (database administrator) – Create user accounts and assign passwords; grant data access by table and user privileges; and set system access on tables, views, and disk space within the database.
- RESOURCE – With read/write privileges to the database, add or change data, and create tables and views.
- CREATE SESSION – Access the database with read-only privilege.
- SELECT – Access specific rows or columns of tables and views with read-only privilege.

Preliminary data may be available for modification for specific activities such as the entry of data quality codes by data validators. However, once the data are declared to be validated/verified by authorized personnel (e.g., qualified data validators for laboratory analytical data or lead field investigators for field data collection verification), the data will be placed in production database tables. Only Data Management staff can modify production tables and only when database change requests have been completed and approved by appropriate project managers and technical specialists. Modifications to validated data will also be tracked electronically as separate variables within database tables. Tracking variables will include the user identification of the person making the change to the database, the date of the change, and the PDCC document control number of the database change request.

Data users responsible for output from application systems will be responsible for developing ways to assure integrity and security of their respective data and programs residing on the various systems. Data Management staff may assist data users in the performance of application systems and data backups.

5.4 BACKUP AND RECOVERY

System failure and other disasters create the potential for accidental data corruption. A rigorous backup and recovery program prevents this possibility. Procedures for the backup and recovery are presented in the Program DMP. The Data Management staff makes and maintains backup copies of data files and data tables for archival. Tapes or cartridges of the backups will be stored both locally and in an area outside the computer facility.

5.5 DATA TRANSFER TO THE NAVY

All the attributes and information within the environmental database (and related applications such as gINT) will be encoded so that transfers of the data to the Navy will be in accordance with NEDTS. Spatial data and drawing files will adhere as closely as practical with the Tri Services Spatial Data Standards. Turnover of the data will take place at CTO closure. Interim data submittals will be made upon request by the Navy Remedial Project Manager.

Section 6
REFERENCES

Bechtel National, Inc. 1993. CLEAN II Data Management Plan. September.

———. 1998a. CLEAN Program Technical Specification for Analytical Laboratory Services. 22214-TS-002. March.

———. 1998b. CLEAN Program Technical Specification for Data Validation Services. 22214-TS-004. December.

———. 2003. Navy CLEAN Program Procedures Manual. Latest revision.

BNI. *See* Bechtel National, Inc.

Southwest Division Naval Facilities Engineering Command. 2001. Environmental Work Instruction No. 1. 28 November.

SWDIV. *See* Southwest Division Naval Facilities Engineering Command.

United States Environmental Protection Agency. 1994. National Functional Guidelines for Data Validation. EPA-540/R-94/012. February.

U.S. EPA. *See* United States Environmental Protection Agency.

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ATTACHMENT D

INVESTIGATION-DERIVED
WASTE MANAGEMENT PLAN

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway
San Diego, California 92132-5190

Contract No. N68711-95-D-7526

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

CLEAN 3

FINAL
INVESTIGATION-DERIVED WASTE MANAGEMENT PLAN
OPERATION AND MAINTENANCE PLAN
OPERABLE UNIT 3
MARINE CORPS AIR STATION TUSTIN
ORANGE COUNTY, CALIFORNIA

CTO-0045/0030
May 2003

Prepared by:

BECHTEL ENVIRONMENTAL, INC.
1230 Columbia Street, Suite 400
San Diego, California 92101-8502

REGISTERED GEOLOGIST
JAMES T. CALLIAN
No. 2154
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GEOLOGIST
STATE OF CALIFORNIA

Signature: ______________________ Date: 5/14/03
James T. Callian, CEG 2154, CTO Leader

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FIGURE

EXHIBITS

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ACRONYMS/ABBREVIATIONS

BNI	Bechtel National, Inc.
CEG	(California) Certified Engineering Geologist
CLEAN	Comprehensive Long-Term Environmental Action Navy
CTO	contract task order
DON	Department of the Navy
IDW	investigation-derived waste
IDWMP	investigation-derived waste management plan
MCAS	Marine Corps Air Station
OU	operable unit
PAH	polynuclear aromatic hydrocarbon
PPE	personal protective equipment
SWDIV	Southwest Division Naval Facilities Engineering Command
UN	United Nations

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Attachment D
INVESTIGATION-DERIVED WASTE MANAGEMENT PLAN

The purpose of this Investigation-Derived Waste Management Plan (IDWMP) is to provide guidelines for the containment, handling, and disposal of investigation-derived waste (IDW) generated during field activities at Operable Unit (OU)-3, Marine Corps Air Station (MCAS) Tustin. This plan was prepared as part of Contract Task Order (CTO)-0045 under the Comprehensive Long-Term Environmental Action Navy (CLEAN) 3 Program, Contract No. N68711-95-D-7526.

1 INTRODUCTION

This plan follows the guidelines presented in Standard Operating Procedure 22, Investigation-Derived Waste Management (BNI 2003). Project- and site-specific background information is provided in the final Record of Decision/Remedial Action Plan for OU-3 (SWDIV 2001) and in the Operation and Maintenance Plan.

2 WASTE GENERATION

The following types of IDW are expected from the field activities:

- decontamination washwater from groundwater and surface water sampling equipment
- purgewater from the 11 existing groundwater monitoring wells
- used personal protective equipment (PPE)
- inert or nonhazardous solid waste (refuse)

2.1 Solid Wastes

The predominant solid waste materials that will be generated during these field activities are used PPE and sampling equipment, and inert or nonhazardous miscellaneous trash and construction materials. The generation of solid wastes will occur throughout the execution of field activities.

A description of the types of solid waste to be generated during fieldwork is presented in the following paragraphs.

2.1.1 USED PERSONAL PROTECTIVE EQUIPMENT AND SAMPLING EQUIPMENT

Used PPE and sampling equipment may potentially become contaminated during monitoring and sampling activities. This solid waste material may be potentially impacted with one or more of the following constituents: petroleum hydrocarbons, chemicals derived from explosives, solvents, heavy metals, pesticides, polynuclear aromatic hydrocarbons (PAHs), landfill gases, or other unknown wastes.

2.1.2 INERT/NONHAZARDOUS TRASH

Some inert and/or known nonhazardous household-style trash will be generated during the fieldwork. This will typically include miscellaneous wastepaper, containers, wrappers, cups, and food- and drink-related items that are not directly associated with environmental sampling.

2.2 Liquid Wastes

Liquid wastes expected to be generated during field activities include decontamination water and purgewater generated during sampling of the 11 existing groundwater monitoring wells. This liquid waste material may be potentially impacted with one or more of the following constituents: petroleum hydrocarbons, chemicals derived from explosives, solvents, heavy metals, pesticides, PAHs, or other unknown wastes.

A description of each type of liquid waste that may be generated during field activities is presented in the following paragraphs. Excess surface water collected during sampling of the Peters Canyon Channel will be returned to the channel. No storage of this water is anticipated.

2.2.1 DECONTAMINATION WATER

Decontamination water will be produced during all phases of the planned field activities. The decontamination water may be generated as part of the cleanup of sampling equipment, vehicles, tanks, and/or bins. This decontamination water will be handled as being potentially hazardous.

2.2.2 PURGEWATER

Purgewater will be produced during the sampling of 11 existing groundwater monitoring wells located in the vicinity of OU-3. The purgewater will be handled as being potentially hazardous.

3 WASTE HANDLING AND STORAGE

Solid and liquid IDW will be stored in United Nations (UN) 55-gallon drums. Mixing regular trash and nonhazardous solid waste with potentially contaminated IDW will be avoided. Noncontaminated PPE and nonhazardous solid waste (refuse) will be placed in industrial waste bins. Contaminated PPE and disposable sampling materials will be placed in covered UN 55-gallon drums.

Each container will be clearly marked to indicate the waste source. Exhibit 1 provides an example of the identification label to be affixed to each container. The label will be black and white (black lettering on white background) and weather resistant. The identification labels will not be used for shipping or disposal purposes. Before disposal or shipment off-site, containers will be labeled with appropriate UN identification and classification information by the waste disposal subcontractor. Following labeling, IDW container maintained by the Site Manager as determined by the Department of the Navy or designee.

IDW generated during field activities at OU-3 will be placed in a container and stored in a secluded area on-site and maintained for interim storage and management. This on-site area is proposed to be located under the Jamboree Road overpass, adjacent to Moffett Road (Figure 1). A fence will be constructed around the storage area with access provided by a lockable gate. The area will be equipped with spill containment and a spill kit. Appropriate signage will be installed at the fenced area.

The IDW storage area and containers will be inspected during each site inspection and/or monitoring event. Any deficiencies found during the inspection that require corrective action (e.g., unlocked gates, missing or damaged labels, leakage, or missing containers) will be recorded on an IDW Inspection Log (Exhibit 3) and reported to the Site Manager. Containers approaching the 90-day storage limit will also be noted.

4 WASTE CHARACTERIZATION AND DISPOSAL

IDW will be disposed off-site by the waste disposal subcontractor within 90 days from the first day of collection. The waste disposal subcontractor will provide services including but not limited to sampling and profiling, handling and manifesting, and transportation and disposal of IDW. The subcontractor will collect IDW samples for analysis and waste profiling as soon as practicable. The DON or its designee will be responsible for selecting the methods/location of IDW disposal and for signing all manifests.

5 REFERENCES

Bechtel National, Inc. 2003. Navy CLEAN Program Procedures Manual. Latest revision.

BNI. *See* Bechtel National, Inc.

Southwest Division Naval Facilities Engineering Command. 2001. Final Record of Decision/Remedial Action Plan, Operable Unit-3, Moffett Trenches and Crash Crew Burn Pits Site, Marine Corps Air Station Tustin, California. December.

SWDIV. *See* Southwest Division Naval Facilities Engineering Command.

INVESTIGATION-DERIVED WASTE

SAMPLED – PENDING ANALYSIS

DO NOT HANDLE OR MOVE DRUM, OR REMOVE LID WITHOUT AUTHORIZATION

The contents of this container have been sampled and are pending analysis. State and federal laws prohibit improper disposal. Questions regarding this container should be directed to one of the Navy/Property Transferee /Regulatory Agencies representatives listed on this label below.

Project:	Navy CLEAN 3
Location:	OU-3, MCAS Tustin, Orange County, CA
Installation Point of Contact:	[Name and phone number]
Site-Specific Location:	[Site location and well locations]
Owner:	U.S. Navy Groundwater Sampling Site OU-3
CTO No.:	045
Property Transferee Project Manager:	Bob (619) 532-0793
Container No.:	[e g., # 0001]
Contents:	[e.g., purgewater, wastewater, used PPE]
Date Container Filled:	[Date]

The example label above is an interim identification label only and will not be used for shipping or disposal purposes. Prior to off-site transportation and disposal, the drums will be labeled with the appropriate project, contact, container contents, and United Nations identification and classification information by the waste disposal subcontractor.

Exhibit 1
Container Identification

CONTAINER INVENTORY LOG

Page ____ of ____

Field activities began ______________

Field activities ended ______________

Container No.	Container Contents (e.g., water, soil, sludge, PPE)	Sampling Location (e.g., boring/well #)	Date Container Filled	Comments

Exhibit 2
Container Inventory Log for CTO-0045

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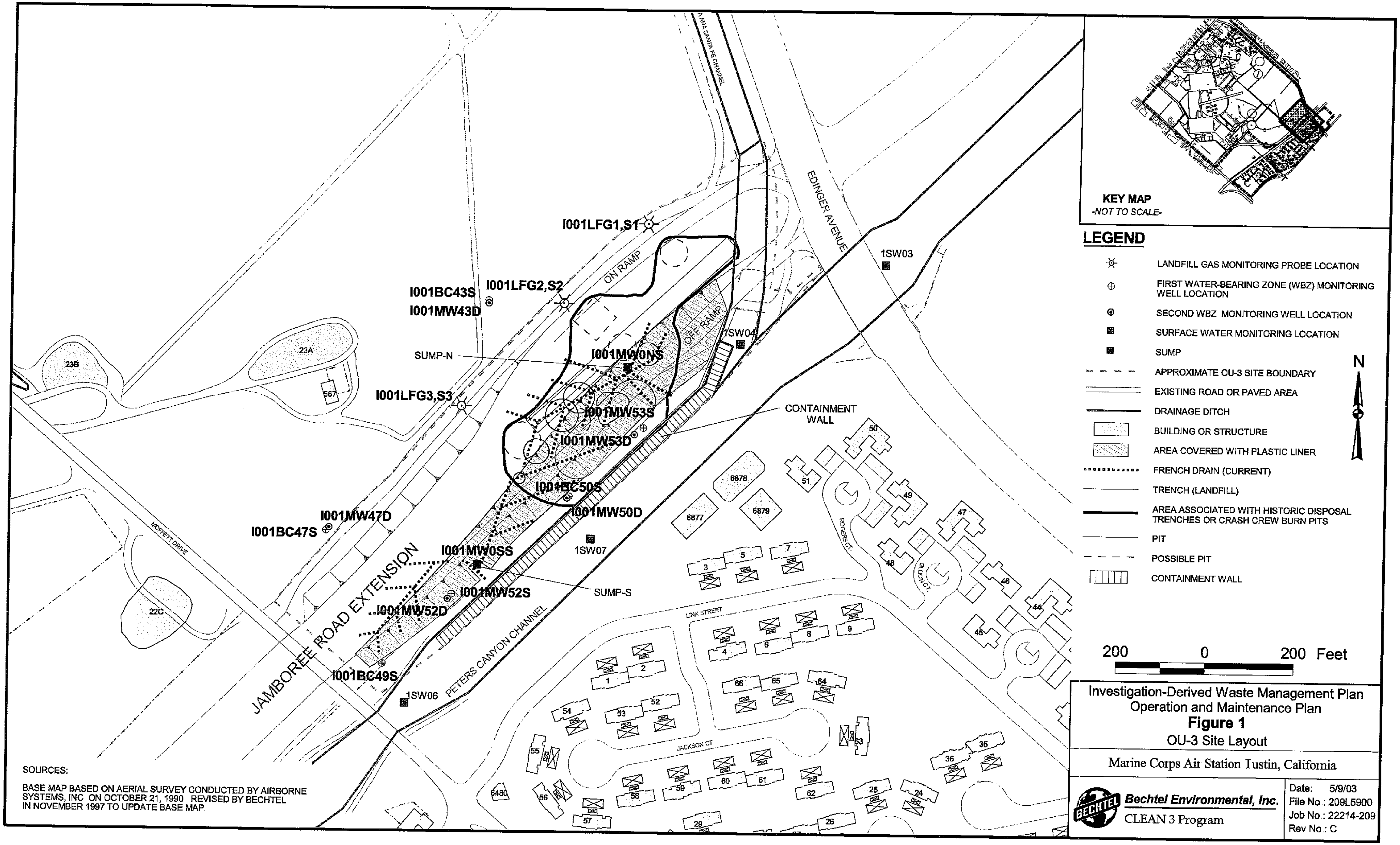

Investigation-Derived Waste Management Plan
Operation and Maintenance Plan

Figure 1

OU-3 Site Layout

Marine Corps Air Station Tustin, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 5/9/03
File No : 209L5900
Job No : 22214-209
Rev No.: C

SOURCES:

BASE MAP BASED ON AERIAL SURVEY CONDUCTED BY AIRBORNE SYSTEMS, INC. ON OCTOBER 21, 1990 REVISED BY BECHTEL IN NOVEMBER 1997 TO UPDATE BASE MAP.

IDW INSPECTION LOG

Page ____ of ____

Storage Area:

Fence:______________ Gate:______________ Lock:______________ Signs:______________

Container No.	Inspection Date and Inspector's Name	Container Condition	Action Required	Action Resolution

Exhibit 3
IDW Inspection Log for CTO-0045

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ATTACHMENT E

SITE-SPECIFIC SAFETY AND HEALTH PLAN SUPPLEMENT

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway
San Diego, California 92132-5190

Contract No. N68711-95-D-7526

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

CLEAN 3

FINAL
SITE-SPECIFIC SAFETY AND HEALTH PLAN SUPPLEMENT
OPERATION AND MAINTENANCE PLAN
OPERABLE UNIT 3
MARINE CORPS AIR STATION TUSTIN
ORANGE COUNTY, CALIFORNIA

CTO-0045/0030
May 2003

Prepared by:

BECHTEL ENVIRONMENTAL, INC.
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No. 2154
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Signature: James T. Callian Date: 5/14/03
James T. Callian, CEG 2154, CTO Leader

Signature: J. Gilbert for Date: 5/14/03
Jon M. Gilbert, Safety and Health Manager

This document serves as a supplement to the CLEAN Program Safety and Health Plan. Section numbering corresponds to section numbering contained in that document. Only sections of the Plan that have been modified appear in this Site-Specific Safety and Health Plan Supplement.

FOREWORD

This Site-Specific Safety and Health Plan Supplement (SSHP) has been prepared in support of Comprehensive Long-Term Environmental Action Navy Program management and technical environmental services of the Navy's Southwest Division Naval Facilities Engineering Command (SWDIV). This SSHP implements applicable Occupational Safety and Health Administration regulations and SWDIV requirements.

Specific elements of this SSHP are intended to be contractor specific and will be provided before implementing the Operation and Maintenance Plan by the contractor selected to conduct long-term monitoring activities at the site. The information provided in this plan and in the contractor-specific plan will be applicable to all personnel entering controlled areas or handling potentially contaminated items or equipment.

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ACRONYMS/ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AL	action level
APR	air-purifying respirator
BDL	below detection limit
bgs	below ground surface
BNI	Bechtel National, Inc.
°C	degrees Celsius
CCR	*California Code of Regulations*
CEG	(California) Certified Engineering Geologist
CFR	*Code of Federal Regulations*
CIWMB	California Integrated Waste Management Board
CLEAN	Comprehensive Long-Term Environmental Action Navy
CNS	central nervous system
COPC	chemical of potential concern
CPR	cardiopulmonary resuscitation
CTO	contract task order
CVS	cardiovascular system
DCA	dichloroethane
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DTSC	(California Environmental Protection Agency) Department of Toxic Substances Control
ERO	Emergency Response Officer
ERP	emergency response plan
ERT	emergency response team
°F	degrees Fahrenheit
FID	flame ionization detector
FP	flash point
GC	gas chromatography
GI	gastrointestinal
HAZMAT	hazardous material
HEPA	high-efficiency particulate air
HWP	hazardous work permit

IDLH	immediately dangerous to life or health
IDW	investigation-derived waste
JP-5	jet propellant grade 5
LEL	lower explosive limit
LFG	landfill gas
LTM	long-term monitoring
$\mu g/L$	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
MCAS	Marine Corps Air Station
MCEF	mixed cellulose ester filter
MEK	methyl ethyl ketone
mg/m^3	milligrams per cubic meter
MSL	mean sea level
NIOSH	National Institute for Occupational Safety and Health
NTU	nephelometric turbidity unit
O&M	operation and maintenance
OCHCA	Orange County Health Care Agency
OMP	operation and maintenance plan
OSHA	Occupational Safety and Health Administration
OU	operable unit
OV	organic vapor
PAH	polynuclear aromatic hydrocarbon
pCi/L	picocuries per liter
PE	polyethylene
PEL	permissible exposure limit
PID	photoionization detector
PP	program procedure
PPE	personal protective equipment
ppm	parts per million
RAP	remedial action plan
RI	remedial investigation
ROD	record of decision
RWQCB	(California) Regional Water Quality Control Board
SHM	Safety and Health Manager
SSHP	site-specific safety and health plan supplement
SSHR	Site Safety and Health Representative

STEL	short-term exposure limit
SWDIV	Southwest Division Naval Facilities Engineering Command
TBD	to be determined
TLV	threshold limit value
UCI	University of California at Irvine
UEL	upper explosive limit
VOC	volatile organic compound
v/v	volume per volume

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Section 1
INTRODUCTION

This Site-Specific Safety and Health Plan Supplement (SSHP) has been developed for groundwater, landfill gas (LFG), and surface water monitoring activities to be conducted as a part of the long-term monitoring (LTM) program required by the final Record of Decision (ROD)/ Remedial Action Plan (RAP) for Operable Unit (OU)-3, Marine Corps Air Station (MCAS) Tustin (SWDIV 2001) (Figures 1-1 and 1-2). OU-3 consists of the Moffett Trenches and Crash Crew Burn Pits sites, formerly known as Installation Restoration Program Site 1, at MCAS Tustin (Figure 1-3). The objective of groundwater, LFG, and surface water monitoring is to verify the effectiveness of the final remedy in containing residual contamination and to document the progress of subsurface physiochemical processes at the site. This plan was prepared for Southwest Division Naval Facilities Engineering Command (SWDIV) under Contract Task Order 0045 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) 3 Program, Contract No. N68711-95-D-7526.

1.1 PURPOSE OF PLAN

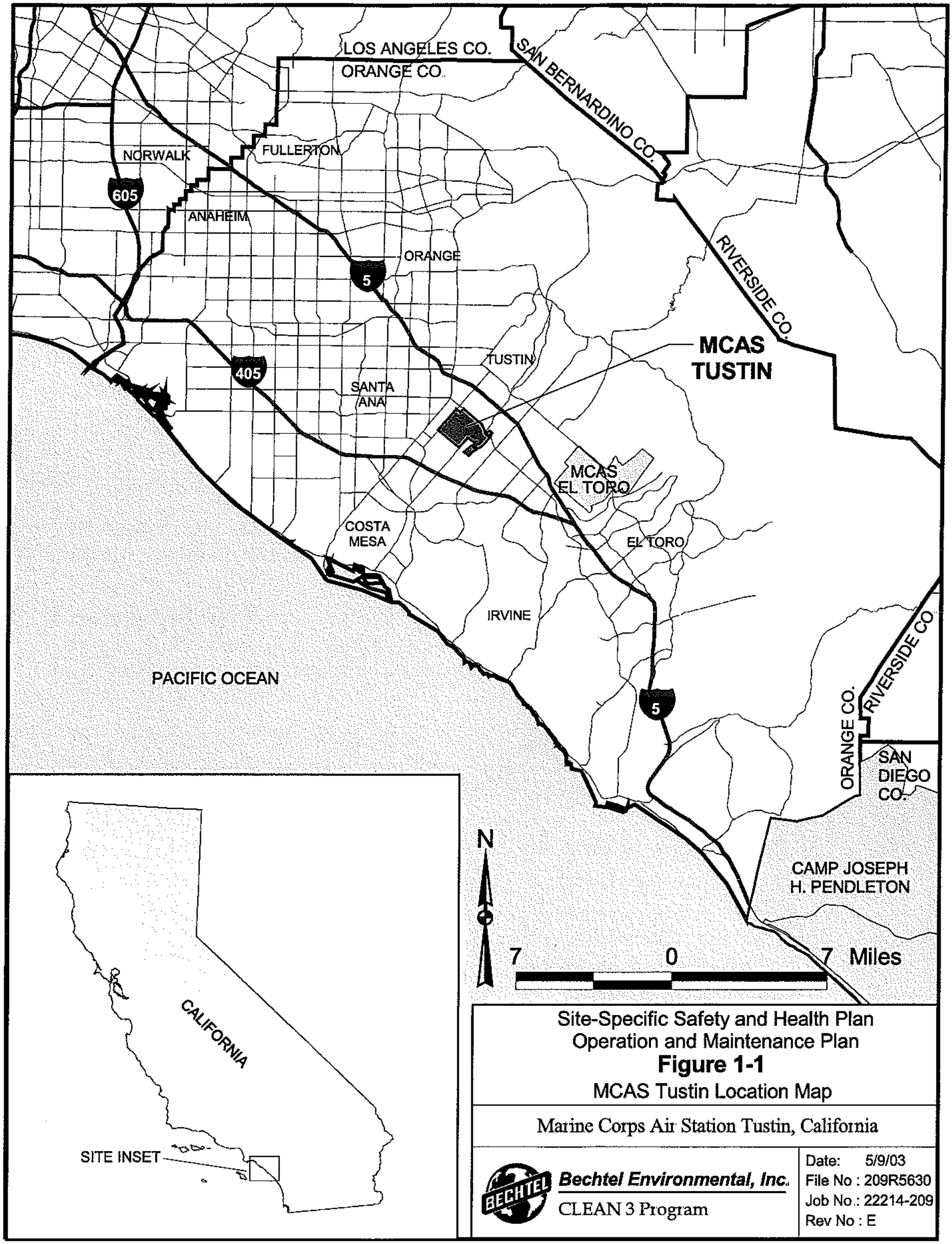
This SSHP addresses sections of the CLEAN Program Safety and Health Plan, Revision 2, that have been modified specifically for fieldwork at OU-3. Section numbering parallels the Program Safety and Health Plan.

This SSHP describes the work to be performed and addresses safety and health concerns related to OU-3 field activities, as well as personal protection requirements and safe working practices, monitoring and site control procedures, and emergency response plans for emergency situations.

1.2 REFERENCE DOCUMENTS

This SSHP has been prepared for use in conjunction with the following safety and health documents:

- Program Safety and Health Plan (Revision 2, September 1997) (BNI 1997)
- Navy/Marine Corps Installation Restoration Manual, February 1997
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, October 1985
- Title 29 *Code of Federal Regulations* (CFR), Section 1910.120
- 29 CFR, Section 1910.165
- Title 8 *California Code of Regulations* (CCR), Section 5192
- 29 CFR, Section 1910.1030
- 29 CFR, Section 1910.1200
- 29 CFR, Section 1919.134
- U.S. Army Corps of Engineers Safety and Health Requirements Manual (EM 385-1-1, September 1996) (USACE 1996)
- Safety and Health Program Procedures (PPs) (BNI 2003)



Site-Specific Safety and Health Plan
Operation and Maintenance Plan

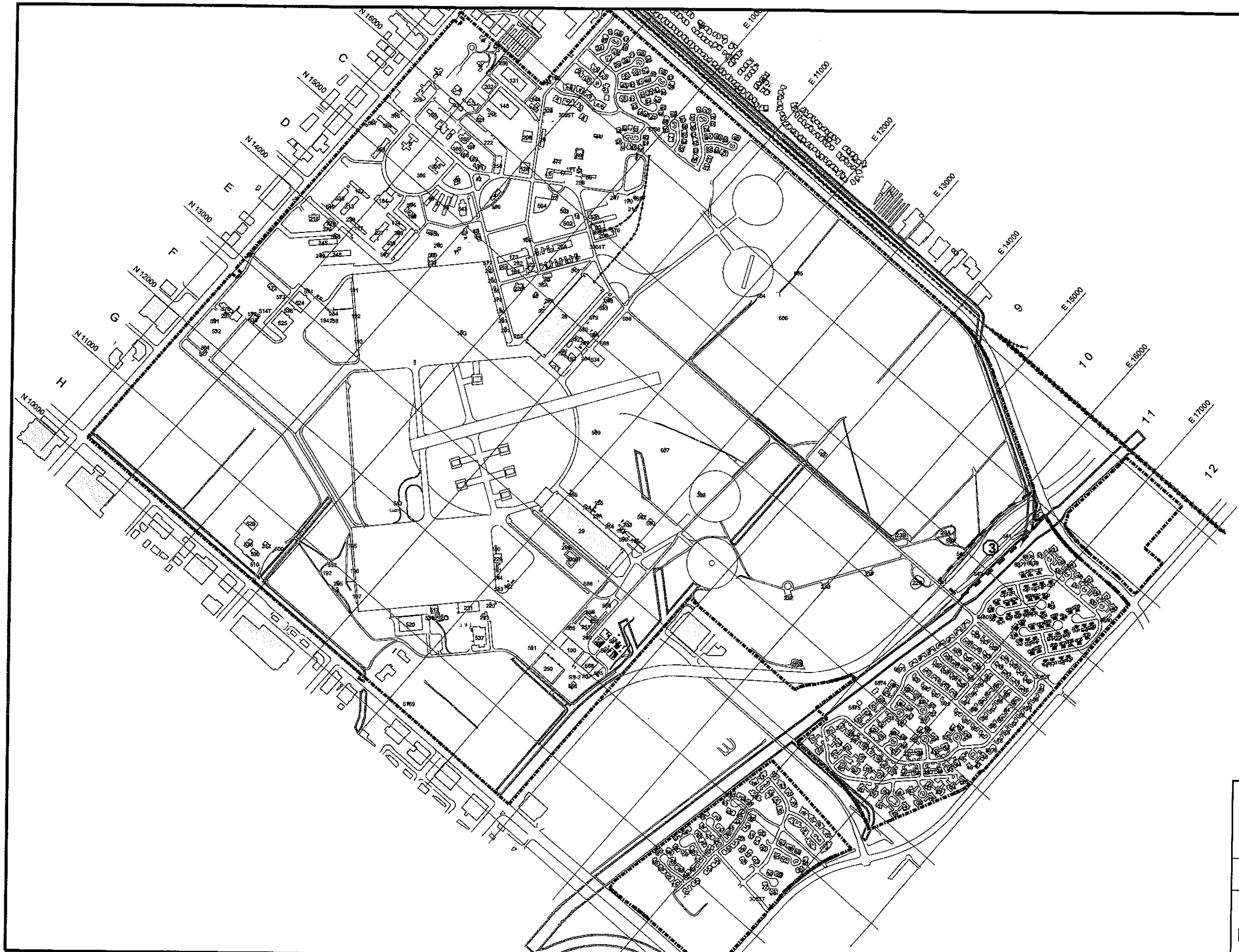
Figure 1-1

MCAS Tustin Location Map

Marine Corps Air Station Tustin, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 5/9/03
File No : 209R5630
Job No.: 22214-209
Rev No : E



LEGEND

APPROXIMATE AREA OPERABLE UNIT 3

GOVERNMENT PROPERTY LINE

EXISTING ROAD OR PAVED AREA

DRAINAGE DITCH

BUILDING OR STRUCTURE

RAILROAD

SOURCES:

BASE MAP BASED ON AERIAL SURVEY CONDUCTED BY AIRBORNE SYSTEMS, INC. ON OCTOBER 21, 1990. REVISED BY BECHTEL IN NOVEMBER 1997 TO UPDATE BASE MAP.

N

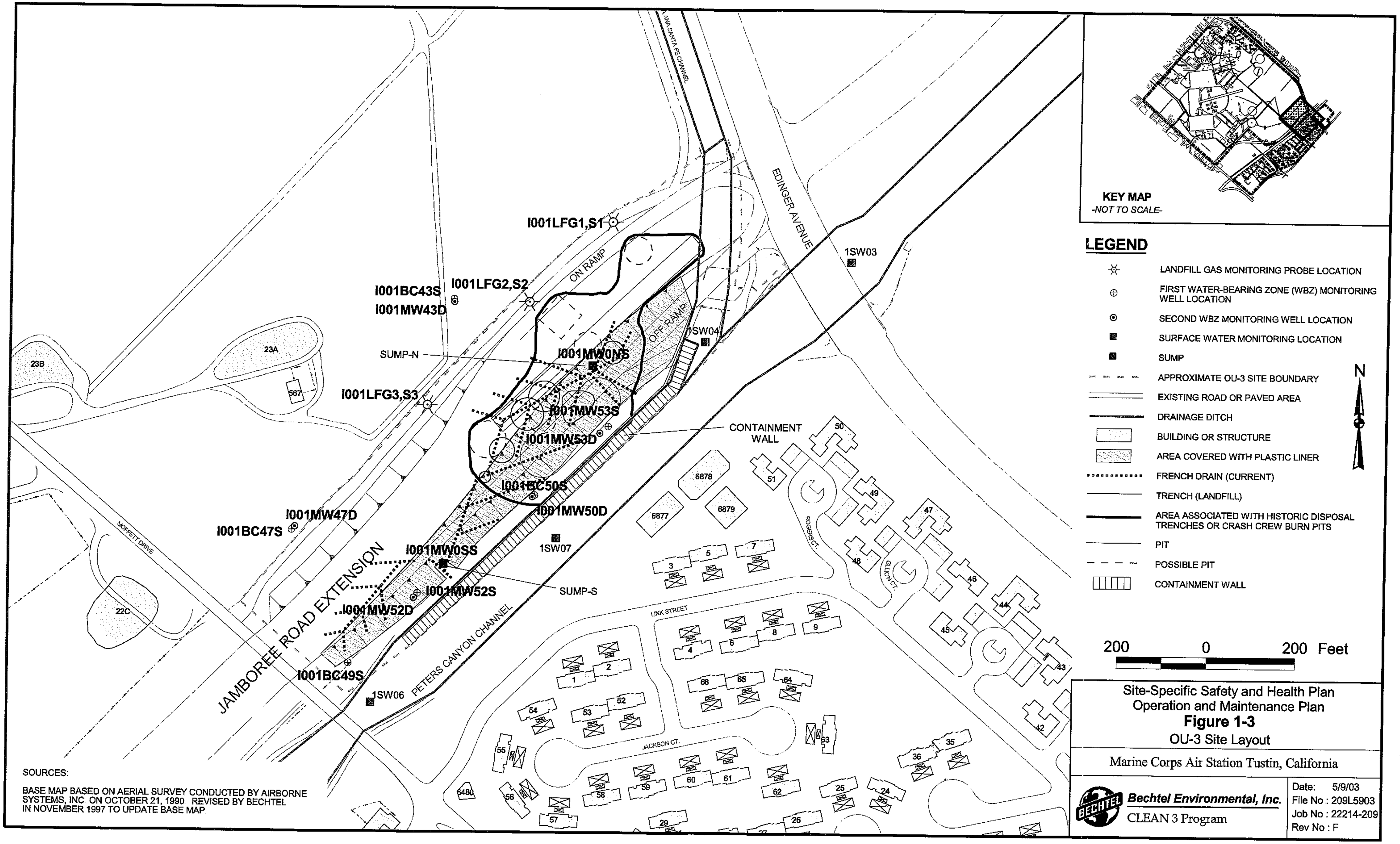
1200 0 1200 Feet

Site-Specific Safety and Health Plan
Operation and Maintenance Plan
Figure 1-2
Site Location Map, Operable Unit 3

Marine Corps Air Station Tustin, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 5/9/03
File No : 209L5631
Job No : 22214-209
Rev No : D


KEY MAP
-NOT TO SCALE-
LEGEND
LANDFILL GAS MONITORING PROBE LOCATION
FIRST WATER-BEARING ZONE (WBZ) MONITORING WELL LOCATION
SECOND WBZ MONITORING WELL LOCATION
SURFACE WATER MONITORING LOCATION
SUMP
APPROXIMATE OU-3 SITE BOUNDARY
EXISTING ROAD OR PAVED AREA
DRAINAGE DITCH
BUILDING OR STRUCTURE
AREA COVERED WITH PLASTIC LINER
FRENCH DRAIN (CURRENT)
TRENCH (LANDFILL)
AREA ASSOCIATED WITH HISTORIC DISPOSAL TRENCHES OR CRASH CREW BURN PITS
PIT
POSSIBLE PIT
CONTAINMENT WALL
N
200 0 200 Feet
I001LFG1,S1
I001LFG2,S2
I001LFG3,S3
I001BC43S
I001MW43D
SUMP-N
I001MW0NS
I001MW53S
I001MW53D
I001BC50S
I001MW50D
I001MW47D
I001BC47S
I001MW0SS
I001MW52S
I001MW52D
I001BC49S
SUMP-S
CONTAINMENT WALL
1SW03
1SW04
1SW06
1SW07
ON RAMP
OFF RAMP
EDINGER AVENUE
JAMBOREE ROAD EXTENSION
PETERS CANYON CHANNEL
MOFFETT DRIVE
LINK STREET
JACKSON CT.
ROGERS CT.
SOURCES:
BASE MAP BASED ON AERIAL SURVEY CONDUCTED BY AIRBORNE SYSTEMS, INC. ON OCTOBER 21, 1990. REVISED BY BECHTEL IN NOVEMBER 1997 TO UPDATE BASE MAP
Site-Specific Safety and Health Plan
Operation and Maintenance Plan
Figure 1-3
OU-3 Site Layout
Marine Corps Air Station Tustin, California
Bechtel Environmental, Inc.
CLEAN 3 Program
Date: 5/9/03
File No : 209L5903
Job No : 22214-209
Rev No : F

Section 2
SITE DESCRIPTION

This section presents background information related to OU-3 at MCAS Tustin. The final ROD/RAP for OU-3 contains a detailed history of the base and regional and site hydrogeology (SWDIV 2001), including requirements for the LTM program.

2.1 WORK AREAS

Jamboree Road, its underpass, and its associated on- and off-ramps are the only structures on OU-3 (Figure 1-3). The OU-3 site contains slopes with vegetative cover to the north and south of Jamboree Road.

2.2 SITE DESCRIPTION AND HISTORY

The following provides a brief description and history of OU-3 based on information presented in the final ROD/RAP for OU-3. Section 5 provides further details about chemicals suspected or found at the site during previous investigations.

The OU-3 area of investigation consists of former unlined, shallow landfill trenches and pits constructed to burn flammable liquids for firefighter training exercises. The exact number and size of the trenches and pits are unknown, and some trenches and pits were constructed over older sections of the trenches. The area covered by the landfill trenches and burn pits has been estimated from aerial photographs and historical information as approximately 600 by 250 feet; this area is shown on Figure 1-3. Other subsurface features at the site include a "fishbone-style" French drain system and associated sumps.

Subsequent to the remedial investigation (RI) of OU-3, extensive road construction activities have taken place at the site. The site is now mostly covered by Jamboree Road, which has been widened, and includes a newly constructed southbound on-ramp and northbound off-ramp. The northbound off-ramp provides access to Peters Canyon Channel. In the road improvements area, a high-density polyethylene liner was installed on top of the original ground surface. Approximately 20 feet of fill material was placed on the site to support elevating and widening Jamboree Road and construction of the elevated ramps. As a result, virtually the entire former waste disposal trenches, pits, and landfill areas are now covered by Jamboree Road. The road improvements also include a surface-water runoff collection system that collects and directs surface water to Peters Canyon Channel.

A dirt access road approximately 15 feet wide is parallel and adjacent to the western bank of Peters Canyon Channel. This road is separated from the remainder of the site by a chain-link fence. The part of the site that has not been covered by the Jamboree Road improvements is a narrow strip between the east Jamboree Road embankment and the fence line and a narrow strip to the west that serves as an access road to the site. A concrete containment wall, approximately 805 feet long, lines the western bank of Peters Canyon Channel adjacent to the site.

2.3 SITE TOPOGRAPHY AND CLIMATE

OU-3 is situated at the eastern edge of a broad coastal plain, an essentially planar alluvial flatland, bounded on the east-northeast by the gentle slopes of Lomas de Santiago along the foothills of the Santa Ana Mountains and on the south by the San Joaquin Hills.

The land surface at MCAS Tustin lies relatively flat, with a gentle slope of approximately 20 feet per mile to the south. The mean surface elevation is approximately 54 feet above mean sea level (MSL), ranging from a maximum of approximately 75 feet above MSL in the north to about 45 feet above MSL in the southern portion of MCAS Tustin. Elevations near OU-3 range from a maximum of about 70 feet above MSL at the Jamboree Road improvements to approximately 36 feet above MSL in Peters Canyon Channel.

The climate of the Tustin area is basically Mediterranean, with hot, dry summers and cool winters. The mean daily temperature is approximately 64 degrees Fahrenheit (°F), with occasional lows around 30 °F and highs up to 100 °F. The average annual precipitation is 12.5 inches, most of which occurs between November and April. The annual evaporation rate is about 60 inches. Prevailing winds are from the west, averaging between 0 and 15 knots. Dry and strong northeasterly winds known as Santa Anas occur for short periods during the late fall to early winter, with maximum velocities ranging from approximately 30 to 50 knots and gusts up to 80 knots.

2.4 KNOWN WASTE CHARACTERISTICS

Chemicals of potential concern (COPCs) were identified during the RI by comparing the analytical results for the various media sampled with site-specific background concentrations. COPCs detected in groundwater, soil, and surface water during the RI conducted for OU-3 are summarized in Tables 2-1 through 2-6. A detailed discussion of the COPCs in each of the media investigated is presented in the final ROD/RAP (SWDIV 2001).

COPCs have not been identified for LFG because volatile organic compounds (VOCs) have not been detected in the LFG monitoring probes installed at the site. The presence of VOCs in LFG, however, may at some time in the future be monitored as a part of the LTM program for OU-3.

Table 2-1
Summary Statistics[a] for Organic COPCs[b] in Groundwater
(results reported in micrograms per liter)

	SHALLOW WELLS		SHALLOW HYDROPUNCH®		SUMPS	
Analyte	Frequency[c]	Range[d]	Frequency[c]	Range[d]	Frequency[c]	Range[d]
Benzene	3/11	9–22	2/7	5–32	0/7	—[e]
2-Butanone	0/11	—	1/7	78	0/7	—
Chlorobenzene	0/11	—	0/7	—	4/7	5–18
4,4′-DDD	1/10	0.12	NA	NA	0/7	—
1,2-Dichlorobenzene	1/10	0.51	NA	NA	13/13	0.8–100
1,3-Dichlorobenzene	0/10	—	NA	NA	9/13	2–10
1,4-Dichlorobenzene	0/10	—	NA	NA	11/13	0.54–82
1,1-Dichloroethane	3/11	57–130	3/7	11–140	4/7	5–41
1,1-Dichloroethene	1/11	8	1/7	6	0/7	—
2,4-Dimethylphenol	0/10	—	NA	NA	1/11	0.8
Ethylbenzene	0/11	—	2/7	3	0/7	—
2-Hexanone	2/11	19–67	0/7	—	0/7	—
JP-5-range organics[f]	2/6	17,000–26,000	NA	NA	3/4	3,000
2-Methylnaphthalene	3/10	0.89–8.4	NA	NA	9/13	0.84–2
Pentachlorophenol	1/10	0.76	NA	NA	0/11	—
Phenol	1/10	4.3	NA	NA	0/11	—
Pyrene	2/10	0.75–0.98	NA	NA	1/13	0.55
1,2,4-Trichlorobenzene	0/10	—	NA	NA	6/13	0.71–1.1
Trichloroethene	1/11	4	1/7	6	0/7	—
Vinyl chloride	0/11	—	2/7	8-9	0/7	—

Notes:
[a] data collected during the RI
[b] organics included in the table were detected in groundwater above the laboratory quantitation limit
[c] frequency of detection
[d] range values represent results detected above the laboratory quantitation limit only
[e] dash indicates not detected
[f] although the JP-5-range organics category represents a range of compounds and therefore is not a COPC by definition, it is included because it is a key indicator of petroleum-product contamination at OU-3

Acronyms/Abbreviations:
COPC – chemical of potential concern
DDD - dichlorodiphenyldichloroethane
JP-5 – jet propellant grade 5
NA – not applicable
OU – operable unit
RI – remedial investigation

Table 2-2
Summary Statistics[a] for Inorganic COPCs and Gross Alpha/Gross Beta in Groundwater

Analyte	SHALLOW WELLS Frequency[b]	SHALLOW WELLS Range[c,d,e]	SUMPS Frequency[b]	SUMPS Range[c,d,e]	Background[c]
Metals					
Antimony	1/9	14.3	10/11	7.3–12.5	BDL
Arsenic	8/9	5.5–77.3	11/11	14.4–103	28.2
Barium	9/9	21.9–130	11/11	25.4–55.7	68.8
Cadmium	2/9	3.5–7.2	6/11	3–5.2	BDL
Chromium	1/9	4.7	1/11	4.3	BDL
Cobalt	1/9	24.5	0/11	—[f]	BDL
Copper	1/9	3.7	2/11	6.2–12	BDL
Manganese	9/9	86.1–4,820	11/11	1,030–3,220	17
Molybdenum	9/9	121–638	11/11	370–956	917
Nickel	1/9	39.2	3/11	15.4–19.2	BDL
Thallium	2/9	6.2–7.3	4/11	3.9–5	4.1
Vanadium	3/9	5.7–109	1/11	7.2	56.6
Zinc	6/9	12.4–50.1	7/11	6.2–585	39.4
Radionuclides					
Gross alpha	1/33	260 ± 100–460 ± 130	2/13	98 ± 50–170 ± 110	BDL
Gross beta	2/33	96 ± 60–370 ± 110	0/13	—	BDL

Notes:
[a] data collected during the RI
[b] frequency of detection
[c] results are reported in µg/L, except gross alpha and gross beta, which are in pCi/L
[d] results represent dissolved metals concentrations (all are nonturbid samples with turbidity defined as less than 5 NTUs) detected above site-specific background concentrations
[e] range values represent results detected above the laboratory quantitation limit only
[f] dash indicates not detected

Acronyms/Abbreviations:
BDL – below detection limit
COPC – chemical of potential concern
µg/L – micrograms per liter
NTU – nephelometric turbidity units
pCi/L – picocuries per liter
RI – remedial investigation

Table 2-3
Summary Statistics[a] for Organic COPCs[b] in Soil[c]
(results reported in micrograms per kilogram)

Analyte	SAMPLES COLLECTED (10 feet bgs)		SAMPLES COLLECTED (15 feet bgs)		SAMPLES COLLECTED (20 to 25 feet bgs)	
	Frequency[d]	Range[e]	Frequency[d]	Range[e]	Frequency[d]	Range[e]
Volatile Organic Compounds						
Benzene	0/3	—[f]	4/4	5.0–800 0	0/4	—
2-Butanone	1/3	5 0	1/4	11 0	0/4	—
1,1-Dichloroethane	0/3	—	3/3	23.0–140.0	0/4	—
1,2-Dichloroethane	0/3	—	1/4	36 0	0/4	—
1,1-Dichloroethene	0/3	—	1/4	5.0	0/4	—
Ethylbenzene	0/3	—	4/4	47.0–12,000	0/4	—
Trichloroethene	0/3	—	2/4	7.0–19 0	0/4	—
Toluene	0/3	—	2/4	4.0–94 0	0/4	—
Vinyl chloride	0/3	—	1/4	26.0	0/4	—
Xylenes (total)	0/3	—	4/4	86.0–7,500	0/4	—
Semivolatile Organic Compounds						
Acenaphthene	0/1	—	1/2	4.8	0/3	—
Benz(a)anthracene	0/1	—	1/2	3.2	0/3	—
Benzo(b)fluoranthene	1/1	10.0	0/2	—	0/3	—
Benzo(g,h,i)perylene	0/1	—	0/2	—	1/3	4.30
Chrysene	0/1	—	1/2	5.5	0/3	—
Fluoranthene	0/1	—	1/2	4.7	0/3	—
Naphthalene	0/1	—	2/2	230–6,400	0/3	—
Phenanthrene	1/1	2.9	1/2	21.0	0/3	—

Notes:
[a] data collected during the RI
[b] organics included in the table were detected in soil above the laboratory quantitation limit
[c] soil samples were collected prior to the addition of fill material associated with the Jamboree Road improvements
[d] frequency of detection
[e] range values represent results detected above the laboratory quantitation limit only
[f] dash indicates not detected

Acronyms/Abbreviations:
bgs – below ground surface
COPC – chemical of potential concern
RI – remedial investigation

Table 2-4
Summary Statistics[a] for Inorganic COPCs[b] in Soil[c]
(results reported in milligrams per kilogram)

	SAMPLES COLLECTED (10 feet bgs)		SAMPLES COLLECTED (15 feet bgs)		SAMPLES COLLECTED (20 to 25 feet bgs)		
Analyte	Frequency[d]	Range[e]	Frequency[d]	Range[e]	Frequency[d]	Range[e]	Background Value[f]
Arsenic	2/2	7.7–18.1	2/2	2.6–8.6	3/4	1.5–4.9	17.5
Beryllium	2/2	0.420–0.450	2/2	0 470–1.30	4/4	0 410–0 630	1.1
Cadmium	0/2	—[g]	2/2	1.7–6.9	2/4	2 8–3.5	1.8
Chromium	2/2	12.6–14.6	2/2	14.3–42.9	4/4	13.0–21.5	39.2
Molybdenum	2/2	6.9–12 6	1/2	7.1	1/4	8.2	10.0
Silver	1/2	1.20	0/2	—	0/4	—	BDL
Vanadium	2/2	35.6–37.5	2/2	57.3–96.9	4/4	36 6–60 8	80 6

Notes:
- [a] data collected during the RI
- [b] inorganics included in the table were detected in soil above background concentrations; other inorganics, such as nickel, copper, and zinc, were detected in soil at the site but not at levels above background concentrations
- [c] soil samples were collected prior to the addition of fill material associated with the Jamboree Road improvements
- [d] frequency of detection
- [e] range values represent results detected above the laboratory quantitation limit only
- [f] BNI 1996
- [g] dash indicates not detected

Acronyms/Abbreviations:
BDL – below detection limit
bgs – below ground surface
BNI – Bechtel National, Inc.
COPC – chemical of potential concern
RI – remedial investigation

Table 2-5
Summary Statistics[a] for COPCs[b] in High Flow[c] Surface Water
(results reported in micrograms per liter)

	DOWNSTREAM/ADJACENT HIGH FLOW		UPSTREAM HIGH FLOW	
Analyte	**Frequency[d]**	**Range[e]**	**Frequency[d]**	**Range[e]**
Semivolatile Organic Compound				
bis(2-ethylhexyl)phthalate	2/6	0.55–0.71	1/5	1.4
Metals				
Barium	6/6	68.9–82.2	3/5	40–45
Cadmium	1/6	5.00	3/5	1.3–3.2
Copper	1/6	21.5	2/5	8.6–9
Lead	2/6	2.1–3.9	0/5	—[f]
Manganese	6/6	25.6–78.6	5/5	19.3–58.4
Thallium	2/6	3.1–3.5	0/5	—
Zinc	4/6	33–74.9	5/5	29.0–52.8

Notes:
[a] data collected during the RI
[b] organics included in the table were detected in surface water above the laboratory quantitation limit; inorganics presented were detected above site-specific background (upstream) concentrations
[c] samples collected after a storm event in January 1996 represent high flow conditions
[d] frequency of detection
[e] range values represent results detected above the quantitation limit only
[f] dash indicates not detected

Acronyms/Abbreviations:
COPC – chemical of potential concern
RI – remedial investigation

Table 2-6
Summary Statistics[a] for COPCs[b] in Low Flow[c] Surface Water
(results reported in micrograms per liter)

	DOWNSTREAM/ADJACENT LOW FLOW		UPSTREAM LOW FLOW	
Analyte	**Frequency[d]**	**Range[e]**	**Frequency[d]**	**Range[e]**
Semivolatile Organic Compound				
bis(2-ethylhexyl)phthalate	1/2	4.8	1/2	0.66
Metals				
Barium	2/2	48.3–77	3/3	31.4–87.8
Cadmium	0/2	—[f]	0/3	—
Copper	2/2	8.8–15	1/3	11.2
Lead	0/2	—	0/3	—
Manganese	2/2	31.3–67.6	3/3	16.9–74.6
Thallium	1/2	3.7	0/3	—
Zinc	2/2	24.7–59.2	3/3	23.3–47.6

Notes:
[a] data collected during the RI
[b] organics included in the table were detected in surface water above the laboratory quantitation limit; inorganics presented were detected above site-specific background (upstream) concentrations
[c] samples collected in October and December 1995 represent low flow conditions
[d] frequency of detection
[e] range values represent results detected above the quantitation limit only
[f] dash indicates not detected

Acronyms/Abbreviations:
COPC – chemical of potential concern
RI – remedial investigation

Section 3
SCOPE OF WORK

Fieldwork planned under the Operation and Maintenance Plan (OMP) includes groundwater, LFG (if required in the future), surface water monitoring, and site inspections.

3.1 TASK SUMMARY

The following specific tasks will be performed at OU-3. Initially, work is planned to be performed quarterly to monitor concentrations of COPCs in groundwater and surface water and (if required in the future) VOCs in LFG under the LTM program, and to inspect the containment wall and landfill cover under the inspection and maintenance plan.

3.1.1 Groundwater Monitoring

The following activities will be performed during groundwater sampling.

- Water levels in each of the monitoring wells and sumps will be recorded before groundwater sampling.
- Eleven wells located at OU-3 will be micropurged and sampled.

3.1.2 Landfill Gas Monitoring

The following activities will be performed (if required) during LFG monitoring.

- The three LFG probes will be monitored for the presence of negative pressure before LFG sampling.
- Water levels in the three probes will be recorded before LFG sampling.
- The concentration of total VOCs will be monitored in each of the three LFG probes installed at the site.

3.1.3 Surface Water Monitoring

The following activities will be performed during surface water monitoring.

- Surface water samples will be collected, if available, from locations in Peters Canyon Channel. Currently, plans are to collect samples at one location upstream from OU-3, one downstream, and two adjacent to the OU-3 area.
- If feasible, collection of surface water samples will be scheduled so that one quarterly sample will be collected during a high-flow event and another during a low-flow event.

3.1.4 Site Inspections

The following activities will be performed during site inspections.

- The containment wall and channel bed will be inspected and maintained as necessary.

- The surface cover, drainage system, and vegetation will be inspected and maintained as necessary.
- The groundwater monitoring system, LFG monitoring probes, and site security measures will be inspected and maintained as necessary.

3.2 PERIOD OF EXECUTION

The period of execution will be dependent on results obtained from the LTM program and from the periodic inspections conducted as a part of the OMP. It may be modified based on the results of the annual and 5-year detailed reviews, as discussed in the OMP and in the Remedial Implementation Plan (BNI 2002).

3.3 PRINCIPAL SUBCONTRACTORS ON-SITE

Table 3-1 identifies subcontractors, if any, scheduled to perform operation and maintenance (O&M) and LTM field activities, which are anticipated to include groundwater, LFG (if required), and surface water monitoring. Table 3-1 will be updated before implementing OMP field activities. Authorized field representatives for subcontract personnel will be identified within 10 days of initiating each field activity.

Table 3-1
Subcontractors for Sampling Activities at OU-3

Subcontractor	Authorized Field Representative	Telephone
To be determined	To be determined	To be determined
To be determined	To be determined	To be determined
To be determined	To be determined	To be determined

Acronym/Abbreviation:
OU – operable unit

Section 4
ORGANIZATION AND RESPONSIBILITIES

Tables 4-1 and 4-2 provide contractor-specific information, Table 4-1 identifies personnel responsible for fieldwork, and Table 4-2 provides additional contact information. Tables 4-1 and 4-2 will be revised before implementing the OMP or in the event that LTM activities and responsibilities are transferred between entities.

Table 4-1
Responsible Personnel for the Site

Title	Name	TELEPHONE NUMBERS Daytime	After Hours
Project Manager	Tim Heironimus	(619) 744-3004	Not available
Contract Task Order Leader	Jim Callian	(619) 744-3061	Not available
Field Coordinator	TBD	TBD	TBD
Field Geologist	TBD	TBD	TBD
Bechtel Site Safety and Health Representative	Ron Prince	(949) 857-6352	(714) 970-5186
Bechtel Safety and Health Manager	Jon Gilbert	(619) 744-3049	(619) 575-8727

Acronym/Abbreviation:
TBD – to be determined

Table 4-2
Additional Contact Information

Entity	Address	Main Telephone	Facsimile	Contact/ Project Manager
Bechtel Environmental, Inc.	1230 Columbia Street Suite 400 San Diego, CA 92101-8502	(619) 687-8700	(619) 687-8787	Tim Heironimus
Brown and Caldwell	9665 Chesapeake Drive Suite 200 San Diego, CA 92123	(858) 514-8822	(858) 514-8833	Vijay Bedi
Kleinfelder	5015 Shoreham Place San Diego, CA 92122	(858) 320-2000	(858) 320-2001	John Moossazadeh
SWDIV	1220 Pacific Highway San Diego, CA 92132-5190	(619) 532-0790	(619) 532-0780	Content Arnold
SWDIV	1220 Pacific Highway San Diego, CA 92132-5190	(619) 532-4228	(619) 532-0780	Melanie Kito

Acronym/Abbreviation:
SWDIV – Southwest Division Naval Facilities Engineering Command

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Section 5
HAZARD IDENTIFICATION

This section discusses hazard assessment and significant hazards associated with fieldwork to be conducted at OU-3.

5.1 HAZARD ASSESSMENT

Table 5-1 shows potential job hazards for OU-3 based on field conditions and activities. See Section 6 for a job-hazard analysis and a hazard assessment. Significant hazards identified during the job-hazard analysis are listed below. Table 5-2 lists chemicals suspected or identified at OU-3.

5.2 SIGNIFICANT HAZARDS

Table 5-1 lists a variety of potential hazards associated with groundwater, surface water, and LFG monitoring at OU-3. The most significant hazards identified during the job-hazard analysis are:

- heat stress and solar radiation,
- metals and volatile and semivolatile organic compounds,
- vehicle traffic,
- manual material handling, and
- LFG.

Table 5-1
Job-Hazard Identification

Risk or Hazard	Evaluation	General Compensatory Measures
Substances identified without OSHA, ACGIH, NIOSH, or other recognized exposure limits	All substances identified have exposure limits.	Frequent exposure monitoring will be conducted. Respiratory protection will be readily available on-site.
Unidentified substances or uncontrolled dumping of objects on-site	Unidentified substances may be present in subsurface areas	Direct instrumentation, colorimetric indicator tubes.
Fire hazard	A slight risk of fire is present.	Fire extinguishers will be present on all site vehicles and heavy equipment. Dry brush will be cleared from site operations.
Regulated carcinogens	Low concentrations of benzene as well as other recognized but unregulated carcinogens are potentially present.	Monitoring with direct-reading instrumentation and screening devices, respiratory protection
Metals and volatile and semivolatile organic compounds	Expected at all areas.	Skin protection will be utilized during groundwater, LFG, and surface water sampling. Respiratory protection will be readily available on-site.
Heat stress	This hazard will be present, particularly when the worker is wearing PPE.	Increase fluid intake; implement work rest regimen; monitor worker core temperature.
Solar radiation	Outdoor work presents this hazard.	Personnel encouraged to use sunscreen or covering clothing
Manual material handling	This hazard is possible when the worker is moving sample coolers or items on the ground.	Proper lifting technique. Using a helper when lifting heavy objects Training.
Slip, trips, and falls	This hazard is possible with equipment and materials placed on ground.	Good housekeeping practices.
LFG	Potential hazard during LFG monitoring.	Monitoring with direct-reading instrumentation and screening devices. Respiratory protection will be readily available on-site Refer to Table 10-2 for action levels for explosive gasses.

(table continues)

Table 5-1 (continued)

Risk or Hazard	Evaluation	General Compensatory Measures
Cuts, contusions, and electrocutions	This hazard is possible from using energized equipment, improper use of equipment, no machine guarding, etc.	Lockout/tagout practices, use of machine guarding, use of safe operating practices.
Traffic (automobile)	This hazard may be present.	Traffic control is required on or at edge of roadways.

Acronyms/Abbreviations:
ACGIH – American Conference of Governmental Industrial Hygienists
LFG – landfill gas
NIOSH – National Institute for Occupational Safety and Health
OSHA – Occupational Safety and Health Administration
PPE – personal protective equipment

Table 5-2
Chemicals and Metals Suspected or Identified at OU-3

Chemical Class	Compounds
Volatile aromatic organics	Benzene, ethylbenzene, toluene, xylenes, vinyl chloride
Polynuclear aromatic compounds	Benz(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)perylene, pyrene, chrysene, fluoranthene, acenaphthene, phenanthrene
Petroleum hydrocarbons	JP-5-range organics
Semivolatile organic compounds	bis(2-ethylhexyl)phthalate, 2-methylnaphthalene, naphthalene, phenol, pentachlorophenol
Ketones	2-hexanone, 2-butanone (MEK)
Chlorinated solvents	Trichloroethene, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, 1,2-dichlorobenzene
Pesticides	4,4′-DDD
Metals	Antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, silver, thallium, vanadium, zinc

Source:
SWDIV 2001

Acronyms/Abbreviations:
DDD – dichlorodiphenyldichloroethane
JP-5 – jet propellant grade 5
MEK – methyl ethyl ketone
OU – operable unit

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Section 6
HAZARD ANALYSIS

This section presents a hazard analysis and details the physical and chemical hazards that have been identified or may potentially be present at OU-3 during field activities. This section also provides a task-specific analysis of hazards encountered and/or associated with work at this site. Table 6-1 presents an analysis of industrial hazards by task.

6.1 RISK ANALYSIS

Field activities will produce low hazards to the field crew. Groundwater, LFG, surface water monitoring, and site inspection activities are categorized as low hazard. No high-hazard work was identified.

6.2 PHYSICAL HAZARDS

Physical hazards associated with field activities include solar radiation; falling, slipping, and tripping; manual lifting; heat stress; and vehicle traffic. The following subsections address categories of physical hazards specific to activities to be conducted at OU-3.

6.2.1 Solar Radiation

During summer, workers must wear covering clothing or sunblock to minimize the harmful effects of the sun's rays on the skin, especially where a shaded area is not readily available.

6.2.2 Falling, Slipping, and Tripping

Work zone surfaces shall be maintained in a neat and orderly condition. Foot traffic shall avoid areas where materials are stored on the ground. Tools and materials shall not be left randomly on surfaces where not in direct use. The field crew leader shall assure that the work area around each sampling location is maintained in a neat and orderly condition. Hoses and cables shall be grouped, routed to minimize hazards, and covered with a ramp or bridge or clearly marked with hazard tape or flags if such material will remain in place for more than one shift.

6.2.3 Manual Lifting

During any manual material-handling tasks, personnel shall be trained to lift with the force of the load suspended on their legs and not on their backs. An adequate number of personnel or an appropriate mechanical device must be used to safely lift or handle heavy equipment. When heavy objects must be lifted manually, workers shall keep the load close to the body and avoid any twisting or turning motions to minimize stress on the lower back. The Site Safety and Health Representative (SSHR) can provide a lifting orientation and specific back-stretching and warm-up exercises to help minimize the potential for back injuries. Use of these exercises by all field personnel at the start of each shift will be encouraged by the SSHR.

Table 6-1
Industrial-Hazard Analysis

Task	Estimated Task Duration	Hazard	Controls
Mobilization and setup	1 day	Vehicle operation Material handling Lifting Pinch points	Training Inspection, training
Groundwater, LFG, and surface water sampling	4 to 5 days	Chemical exposure	Safety rule training, site control, decontamination protocols, PPE, respirators, air monitoring
Decontamination of equipment	Daily	Chemical exposure Steam and hot water Chemical cleaners	Safety rule training, site control, decontamination protocols, PPE, respirators, air monitoring

Acronyms/Abbreviations:
LFG – landfill gas
PPE – personal protective equipment

6.2.4 Heat Stress

Weather conditions, characterized by high temperatures and low humidity, combined with wearing personal protective clothing, may aggravate heat-stress problems. Standard measures, including designating a shaded rest area, taking frequent rest breaks, and performing heat-stress monitoring of workers, will be used to minimize heat stress. Increased consumption of liquids, such as water and fluids containing electrolytes, will be available at the work site to replenish body fluids. The SSHR will observe workers for heat-stress symptoms and record observations. Symptoms of heat stress include profuse sweating, headache, skin flushing, dizziness, confusion, and rapid heart rate. Body-core temperature will be monitored when conditions warrant. Workers exhibiting a body-core temperature of 100.4 °F or greater (measured at the eardrum) will be removed to a cooler area or activity until body-core temperature returns to below 99 °F. See Section 10 for heat-stress action levels and frequency of core temperature monitoring.

If persons exhibiting heat-stress symptoms are not treated, the condition can elevate to heatstroke. Heatstroke is typically manifested by hot, dry skin with a body-core temperature of 104 °F or greater. Heatstroke can be fatal if treatment is delayed. If a person shows signs of heatstroke, immediately reduce the core temperature by using cold packs, cold water wipes, or immersion. Immediately transport any heatstroke victim to a professional medical facility after the core temperature is reduced or while the core temperature is being reduced.

6.2.5 Work Near Roadways

Traffic control shall be implemented in accordance with installation requirements or the Manual of Traffic Controls for Construction and Maintenance Work Zones. Employees performing traffic control shall wear orange garments in the daytime and reflectorized garments after dusk. Work near roadways will be halted during periods of heavy rainfall.

6.3 CHEMICAL HAZARDS

This section describes the toxicological (health) hazards associated with exposure to organic and inorganic chemicals and metals during the project.

See Table 5-2 for a list of contaminants detected or suspected to be present in groundwater, LFG, and surface water. Table 6-2 summarizes the toxicological properties of these contaminants.

6.3.1 Carcinogens

Carcinogens are any chemicals or products capable of causing or inducing cancer or leukemia in humans. Carcinogens are classified, based on Occupational Safety and Health Administration (OSHA), American Conference of Governmental Industrial Hygienists (ACGIH), International Agency for Research on Cancer, or National Toxicology Program classifications, into recognized or confirmed human carcinogens (Class I), suspected human carcinogens (Class II), questionable carcinogens (Class III), or not recognized as carcinogenic. Exposure by any route to recognized human carcinogens without published exposure limits shall be maintained at the absolute practicable minimum level. Low concentrations of benzene as well as other recognized but unregulated carcinogens are potentially present at the site.

6.3.2 Nonaromatic Hydrocarbons

The category of nonaromatic hydrocarbons refers to a variety of volatile and semivolatile compounds, including simple hydrocarbons such as propane, pentane, and octane. These unspecified compounds are present in petroleum hydrocarbon mixtures and may exist as gas, vapor, liquid, or some combination of these compounds. The compounds are generally of low toxicity; however, they produce a narcotic effect at moderate concentrations. Exposure to nonaromatic hydrocarbons at moderate concentrations may affect the operator's ability to operate machinery. The low toxicity of these materials is not a basis for allowing exposure in excess of established limits.

6.3.3 Heavy Metals

A variety of heavy metals are encountered as contaminants at industrial and military sites. Some heavy metals are highly toxic; others are also recognized human carcinogens. Because these materials are not volatile unless highly heated, control by proper use of personal protective equipment (PPE) and personal hygiene practices will prevent significant exposure to heavy metals.

Table 6-2
Toxicological Properties of Chemical Compounds Suspected to Be Present

Chemical	Exposure Limits	Target Organs	Symptoms and Effects	Sampling Method and/or Media	Exposure Routes
ORGANIC COMPOUNDS					
Aromatic Hydrocarbons					
Benzene	AL: 0.5 ppm PEL: 1 ppm STEL: 5 ppm TLV: 0.5 ppm IDLH: 500 ppm	Blood, CNS, skin, bone marrow, eyes, respiratory system	Irritated eyes, skin, respiratory system; giddiness; headache; nausea; staggering gait; fatigue; anorexia; inflamed skin; bone marrow depressant; carcinogen	Charcoal tube	Inhalation, skin absorption, ingestion, contact
Ethylbenzene	AL: NE PEL: 100 ppm STEL: 125 ppm TLV: 100 ppm IDLH: 800 ppm	CNS, skin, eyes, respiratory system	Irritated eyes, skin, mucous membrane; headache; stupor; coma	Charcoal tube	Inhalation, ingestion, contact
Chlorobenzene	AL: NE PEL: 10 ppm STEL: NE TLV: 10 ppm IDLH: 1,000 ppm	Eyes, nose, skin, nervous system	Redness and inflammation of eyes, runny nose, sore throat, skin irritation, headache, dizziness, incoherence, respiratory problems	Coconut shell solid sorbent tube, GC	Inhalation, ingestion
Toluene	AL: NE PEL: 50 ppm STEL: 150 ppm TLV: 50 ppm IDLH: 500 ppm	CNS, liver, kidneys, skin, eyes, respiratory system	Irritated eyes, nose, throat; fatigue, weakness; confusion; euphoria; dizziness; headache; dilated pupils, watery eyes; nervousness; muscle fatigue; insomnia; tingling, inflamed skin; liver, kidney damage	Charcoal tube	Inhalation, skin absorption, ingestion, contact
Xylene(s)	AL: NE PEL: 100 ppm STEL: 150 ppm TLV: 100 ppm IDLH: 900 ppm	CNS, liver, kidneys, skin, eyes, respiratory system, GI tract, blood	Irritated eyes, skin, nose, throat; dizziness; excitement; drowsiness; incoordination; staggering gait; corneal vacuolation; anorexia, nausea, vomiting, abdominal pain; inflamed skin	Charcoal tube	Inhalation, skin absorption, ingestion, contact

(table continues)

Table 6-2 (continued)

Chemical	Exposure Limits	Target Organs	Symptoms and Effects	Sampling Method and/or Media	Exposure Routes
Ketones					
2-butanone (MEK)	AL: NE PEL: 200 ppm STEL: 300 ppm TLV: 200 ppm IDLH: 3,000 ppm	Eyes, skin, respiratory system, CNS	Irritated eyes, skin, nose; headache, dizziness, vomiting, dermatitis	Carbon beads, GC/FID	Inhalation, ingestion, contact
Petroleum Distillates					
Diesel fuel/kerosene (JP-5-range organics)	AL: NE PEL: NE STEL: NE TLV: 100 mg/m^3 IDLH: NE	Eyes, skin, respiratory system, CNS	Irritated eyes, skin, nose, throat; confusion; inflamed skin; burning sensation in chest; chemical pneumonia from aspirated liquid	Charcoal tube	Inhalation, skin absorption, ingestion, contact
Semivolatile Organics					
Polynuclear aromatic hydrocarbons (group all as PAHs or coal tar pitch derivatives)	AL: NE PEL: 0.2 mg/m^3 STEL: NE TLV: 0.2 mg/m^3 IDLH: 80 mg/m^3	Respiratory system, skin, bladder, kidneys	Inflamed skin; bronchitis; lung, kidney, and skin cancer	Filter	Inhalation, contact
Naphthalene	AL: NE PEL: 10 ppm STEL: 15 ppm TLV: 10 ppm IDLH: 250 ppm	Eyes, skin, blood, liver, kidneys, CNS	Irritated eyes; headache; confusion; excitement; malaise; nausea, vomiting, abdominal pain; profuse sweating; jaundice; irritated bladder, blood in urine, hemoglobin present in urine, renal shutdown; inflamed skin; eye inflammation and irritation, corneal damage	Charcoal filter	Inhalation, skin absorption, ingestion, contact

(table continues)

Table 6-2 (continued)

Chemical	Exposure Limits	Target Organs	Symptoms and Effects	Sampling Method and/or Media	Exposure Routes
Chlorinated solvents					
Trichloroethylene	AL: NE PEL: 25 ppm STEL: 100 ppm TLV: 50 ppm IDLH: 1,000 ppm	Eyes, respiratory system, liver, heart, CNS, skin	Irritated eyes, skin; headaches; vertigo; vision disturbances; fatigue; giddiness; tremors; sleepiness; nausea, vomiting; cardiac arrhythmia; tingling, inflamed skin; liver damage; liver and kidney cancer in animals	Charcoal tube	Inhalation, skin absorption, ingestion, contact
1,1-DCA	AL: NE PEL: 100 ppm STEL: NE TLV: 100 ppm IDLH: 3,000 ppm	Skin, lungs, liver, CNS, kidneys	Irritated skin, CNS depression; liver, kidney, lung damage	Charcoal tube	Inhalation, ingestion, contact
1,1-DCE (Vinylidene chloride)	AL: NE PEL: 1 ppm STEL: NE TLV: 5 ppm IDLH: NE	Eyes, skin, kidneys, liver, CNS, CVS	Irritated eyes, skin, throat; dizziness, headache, nausea, breathing difficulty; liver, kidney dysfunction, pneumonitis; NIOSH considers a carcinogen	Charcoal tube	Inhalation, skin absorption, ingestion, contact
1,2-dichlorobenzene	AL: NE PEL: 50 ppm (C) STEL: 50 ppm TLV: 25 ppm IDLH: 200 ppm	Eyes, skin, respiratory system, liver, kidneys	Irritated eyes, nose, liver; kidney damage; skin; blisters	Charcoal tube	Inhalation, skin absorption, ingestion, contact
Vinyl chloride	AL: 0.5 ppm PEL: 1 ppm STEL: NE TLV: 1 ppm IDLH: NE	Respiratory system, liver, lymphatic system, CNS, blood	Weakness; abdominal pain, GI bleeding; enlarged liver; pallor, bluish skin color on extremities; frostbite (liquid); liver cancer	Charcoal tube	Inhalation, ingestion, contact

(table continues)

Table 6-2 (continued)

Chemical	Exposure Limits	Target Organs	Symptoms and Effects	Sampling Method and/or Media	Exposure Routes
Chemical Asphyxiants					
Hydrogen sulfide	AL: NE PEL: 10 ppm STEL: 15 ppm TLV: 5 ppm IDLH: 100 ppm	Eyes, respiratory system, CNS	Irritated eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, watery eyes, visual intolerance to light; dizziness; headache; fatigue; irritability; insomnia; GI disturbance	Direct-reading instrument, detector tubes, charcoal	Inhalation, contact
Common Simple Asphyxiants (flammable gases, may be flammable in high concentrations)		Not applicable	Not applicable		
Hydrogen	LEL: 4.1% UEL: 74.2% FP: -498 °F lighter than air	Note: Simple asphyxiants are "inert" gases or vapors. A number of gases and vapors, when present in high concentrations in air, act primarily as simple asphyxiants without other significant physiologic effects. A TLV may not be recommended for each simple asphyxiant because the limiting factor is the available oxygen. The minimal oxygen content should be 18 percent by volume under normal atmospheric pressure (equivalent to a partial pressure, pO_2 of 135 torr). Atmospheres deficient in O_2 do not provide adequate warning and most simple asphyxiants are odorless. Several simple asphyxiants present an explosion hazard. This factor should be taken into account in limiting the concentration of the asphyxiant.		Combustible gas meter/ oxygen meter	Inhalation
Methane	LEL: 5.3% UEL: 15% FP: -306 °F lighter than air	Not reported	Not reported	Combustible gas meter/ oxygen meter	Inhalation

(table continues)

Table 6-2 (continued)

Chemical	Exposure Limits	Target Organs	Symptoms and Effects	Sampling Method and/or Media	Exposure Routes
INORGANIC COMPOUNDS					
Metals					
Arsenic	AL: NE PEL: 0.01 mg/m^3 STEL: NE TLV: 0.01 mg/m^3 IDLH: 5 mg/m^3	Liver, kidneys, skin, lungs, lymphatic system	Ulceration of the nasal septum; inflamed skin; GI disturbances; respiratory irritation; numbness of arms and legs; hyperpigmentation of the skin; carcinogen	0.8-micrometer MCEF filter	Inhalation, ingestion, skin contact
Barium	AL: NE PEL: 0.5 mg/m^3 STEL: NE TLV: 0.5 mg/m^3 IDLH: 50 mg/m^3	Eyes, skin, respiratory system, central nervous system	Irritated eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasms; slow pulse	Filter	Inhalation, ingestion, contact
Chromium (III)	AL: NE PEL: 0.5 mg/m^3 STEL: NE TLV: 0.5 mg/m^3 IDLH: 25 mg/m^3	Eyes, skin	Inflamed, irritated skin	Filter	Inhalation, ingestion, contact
Chromium (VI)	AL: NE PEL: 0.1 mg/m^3 (C) STEL: NE TLV: 0.05 mg/m^3 IDLH: 15 mg/m^3	Blood, respiratory system, liver, kidneys, eyes, skin	Irritated respiratory system; nasal septum perforation; liver, kidney damage; leukocytosis, leukopenia, monocytosis, eosinophilia; eye injury; conjunctivitis; skin ulcers; inflamed, irritated skin; lung cancer	Filter	Inhalation, ingestion, contact

(table continues)

Table 6-2 (continued)

Chemical	Exposure Limits	Target Organs	Symptoms and Effects	Sampling Method and/or Media	Exposure Routes
Cadmium	AL: NE PEL: 0.005 mg/m^3 STEL: NE TLV: 0.005 mg/m^3 IDLH: 9 mg/m^3	Skin, nose, respiratory system	Nose and throat irritation, respiratory problems, sweating, chills, chest pain, nausea, abdominal cramps	Filter	Inhalation, ingestion
Cobalt	AL: NE PEL: 0.02 mg/m^3 STEL: NE TLV: 0.02 mg/m^3 IDLH: 20 mg/m^3	Eyes, nose, throat, respiratory system, skin	Respiratory tract irritation, hypersensitivity, respiratory diseases	Cellulose membrane filter	Inhalation, ingestion
Manganese	AL: NE PEL: 0.2 mg/m^3 (C) STEL: NE TLV: 0.2 mg/m^3 IDLH: 500 mg/m^3	Respiratory system, CNS, blood, kidneys	Degenerative brain changes; weakness; insomnia; mental confusion; metal fume fever; dry throat, coughing, chest tightness, dyspnea; rales; flulike fever; lower back pain; vomiting; malaise; fatigue; kidney damage	Filter	Inhalation, ingestion
Molybdenum	AL: NE PEL: 10 mg/m^3 STEL: NE TLV: 10 mg/m^3 IDLH: 5,000 mg/m^3	Eyes, respiratory system, liver, kidneys	In animals: irritated eyes, nose, throat, anorexia, diarrhea, low weight, listlessness; liver and kidney damage	Filter	Inhalation, ingestion, contact
Nickel	AL: NE PEL: 1 mg/m^3 STEL: NE TLV: 1.5 mg/m^3 IDLH: 10 mg/m^3	Nasal cavities, lungs, skin	Allergic asthma; irritated, inflamed skin, pneumonitis; lung and nasal cancer	0.8-micrometer MCEF filter	Inhalation, ingestion, contact
Silver	AL: NE PEL: 0.01 mg/m^3 STEL: NE TLV: 0.01 mg/m^3 IDLH: 10 mg/m^3	Nasal septum, skin, eyes	Respiratory tract irritation, dermatitis, skin ulceration	Acid filter	Inhalation, ingestion, contact

(table continues)

Table 6-2 (continued)

Chemical	Exposure Limits	Target Organs	Symptoms and Effects	Sampling Method and/or Media	Exposure Routes
Thallium	AL: NE PEL: 0.1 mg/m^3 STEL: NE TLV: 0.1 mg/m^3 IDLH: 15 mg/m^3	Eyes, respiratory tract, central nervous system, liver, kidney, body hair, GI tract	GI distress, fatigue, vomiting; eye irritation, fatigue, optic atrophy; tremor, mental abnormalities, psychosis	Filter	Inhalation, ingestion, contact, adsorption
Vanadium	AL: NE PEL: 0.05 mg/m^3 STEL: NE TLV: 0.05 mg/m^3 IDLH: 35 mg/m^3	Eyes, skin, respiratory system	Irritated eyes, skin, throat; green tongue; metallic taste; cough; wheezing; breathing difficulty	Filter, x-ray diffraction spectrometry	Inhalation, ingestion, contact
Zinc	AL: NE PEL: 15 mg/m^3 STEL: NE TLV: 10 mg/m^3 IDLH: 500 mg/m^3	Respiratory system	Metal fume fever, skin irritation, GI tract effects, dermatitis	Filter	Inhalation, ingestion

Sources:

Action Levels, Permissible Exposure Limits, 29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances, General Industry Safety Orders, Title 8, Article 5155

Short-Term Exposure Limits, Immediate Danger to Life and Health, Harmful Effects, Symptoms, Method of Analysis and Routes of Exposure, National Institute for Occupational Safety and Health, Pocket Guide to Chemical Hazards

Threshold Limit Values, American Conference of Governmental Industrial Hygienists

Acronyms/Abbreviations:

AL – action level
C – ceiling limit
Ca – carcinogen – exposure limited to lowest feasible concentration
CNS – central nervous system
CVS – cardiovascular system
DCA – dichloroethane
DCE – dichloroethene
DDD – dichlorodiphenyldichloroethane
°F – degrees Fahrenheit
FID – flame ionization detector
FP – flash point
GC – gas chromatography
GI – gastrointestinal

(table continues)

Table 6-2 (continued)

IDLH – immediately dangerous to life or health
JP-5 – jet propellant grade 5
LEL – lower explosive limit
$\mu g/m^3$ – micrograms per cubic meter
MCEF – mixed cellulose ester filter
MEK – methyl ethyl ketone
mg/m^3 – milligrams per cubic meter
NE – not established
NIOSH – National Institute for Occupational Safety and Health
PAH – polynuclear aromatic hydrocarbon
PEL – permissible exposure limit
ppm – parts per million
STEL – short-term exposure limit
TLV – threshold limit value
UEL – upper explosive limit

6.4 LANDFILL DECOMPOSITION GASES

Decomposition of organic materials results in the production of several gases that may present a safety and health concern. The reader should note that vinyl chloride, methane, and hydrogen sulfide have not been detected in any of the LFG monitoring probes installed at the site. In addition, no intrusive subsurface field activities are planned under the LTM program for OU-3.

6.4.1 Vinyl Chloride

Vinyl chloride results from the decomposition of chlorinated materials such as plastics and solvents. Vinyl chloride is recognized as a human carcinogen. The OSHA standard for vinyl chloride established an exposure limit of 1 part per million (ppm) as a time-weighted average. Where measured concentrations may exceed 10 ppm, only a Type C air line or self-contained breathing apparatus unit may be used for respiratory protection. When negative-pressure air-filtering respirators are used, the air filter cartridges will be replaced daily.

6.4.2 Methane Gas

Methane gas may be encountered as a result of biological processes in soil during excavation activities. Methane is an explosive hazard and can displace oxygen in confined spaces or trenches. Methane will be monitored as an explosive gas. Photoionization detectors (PIDs) do not detect methane; therefore, either a flame ionization detector (FID) or explosimeter will be used where a potential for methane gas is identified.

6.4.3 Hydrogen Sulfide

Hydrogen sulfide is a colorless, heavier-than-air gas with a characteristic odor. Hydrogen sulfide is commonly found at landfills. It can be toxic or fatal if inhaled in high concentrations Monitoring equipment or detector tubes shall be available for confined space or trench entry and if hydrogen sulfide is suspected. This chemical has the property of numbing the olfactory senses after a brief exposure, which limits the usability of air-purifying respirators (APRs). APR protection shall only be used if monitoring equipment is continuously available. Where hydrogen sulfide is experienced above 10 ppm, personnel shall carry either industrial gas masks or escape respirators, and alarm monitors.

6.5 BIOLOGICAL HAZARDS

The Site Safety and Health Representative (SSHR) will screen the area for biological hazards during the initial site visit and will discuss any problems with installation personnel during the prework preview. The most common hazards anticipated at the site are discussed below.

6.5.1 Fire Ants

The Orange County Health Care Agency (OCHCA) has issued a medical and health care alert for fire ants. Fire ant sting reactions range from localized itching and swelling to severe, life-threatening anaphylaxis, which is a generalized, systemic allergic reaction that may be life threatening.

Local reactions may be treated as follows.

- Elevate the extremity and apply ice or a cold compress to reduce swelling and relieve pain.
- Clean the blisters with soap and water to prevent secondary infection. Do not break the blisters.
- Use topical steroid ointments and oral antihistamines to relieve the itching associated with these reactions.
- Treat with oral steroids as well as oral antihistamines in severe cases.
- Since the swelling is due to allergy and not infection, antibiotics are usually not necessary. However, seek medical attention if the swelling progresses or if infection is suspected.

Anaphylactic reactions should be managed as a medical emergency. Section 16 describes procedures to be followed in the event of a medical emergency. If stung, persons at risk should immediately self-administer epinephrine, take an antihistamine, and report to a physician or emergency room. To avoid stings, personnel should wear closed-toed shoes, socks, and gloves when working at OU-3.

6.5.2 Hantavirus and Arenavirus

Rodents are the primary reservoir for a particularly virulent virus commonly called hantavirus. These animals spread the virus through saliva, urine, and feces.

Infection is characterized by the abrupt onset of fever, muscle pain, and headache. By 1997, there had been 123 deaths in the United States attributed to the virus, with almost all cases occurring west of the Mississippi and 13 confirmed deaths in California alone. The virus is fatal 52 percent of the time.

To reduce the risk of infection, field personnel should avoid contact with mice and mouse burrows or nests. The Program Safety and Health Plan provides a more detailed discussion of the effects of the hantavirus and additional steps to decrease the likelihood of exposure.

The arenavirus has also been reported in rodents in the western United States. The precautions used to minimize the risk of infection from the hantavirus should provide adequate protection from the arenavirus, which is also associated with rodent droppings, urine, and fleas.

6.5.3 Rattlesnakes

Personnel should be extremely careful when walking through tall grass, rocks, or debris. If a rattlesnake is encountered, slowly and quietly back away from the snake. Inform all personnel at the site of its location. Do not attempt to move or kill a snake because certain species of rattlesnake are protected under state and federal laws. In the event of a snakebite, immediately summon emergency medical services and notify the SSHR. Do not try to move the affected limb; instead, immobilize the injured area, keeping it lower than the heart if possible, and wait for transportation. Do not apply ice, do not cut the wound, do not apply a tourniquet. The venom should be wiped off the skin since venom will attack intact skin. If you know the victim cannot receive medical care within 30 minutes, consider suctioning the wound using a snakebite kit.

Section 7
SITE CONTROL

A site control program will be established based on site-specific characteristics and monitoring activities to be conducted at OU-3.

7.1 SITE WORK AUTHORIZATION

Field activities will be authorized under a hazardous work permit (HWP) or equivalent system. HWPs may be prepared either for general activities at a number of site work areas with similar hazards and control measures or for a specific activity and location. The SSHR and field crew will prepare HWPs before beginning fieldwork.

7.2 CONTROLLED AREA DESIGNATION

During sampling activities precautions will be taken to assure that only authorized personnel with the proper training and personal protective equipment (PPE) will have access to work areas where the potential for exposure to hazardous conditions/materials may exist. In these areas, access is controlled with fencing with lockable gates installed around the site perimeter, caution tape, and/or barricades. At SSHR discretion, a three-zone controlled-area system may be established including an inner "exclusion zone" (contaminated area), a "contamination reduction zone" (decontamination area), and an outer "support" zone. While in the support zone, workers will not be exposed to hazardous conditions.

7.3 ACCESS CONTROL

While overseeing activities during the OU-3 LTM program, the SSHR will compile an Authorized Personnel Roster. Only individuals listed on the roster will be permitted in controlled areas.

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Section 8
DECONTAMINATION

The primary focus of any decontamination program is to minimize the spread of contaminated material beyond a given site. Each field location will have a decontamination station based on the level of exposure established by the Safety and Health Supervisor (SHS) and the hazardous work permit.

8.1 PERSONNEL DECONTAMINATION

A three-station decontamination system will be established at each field location where sampling operations present an exposure risk to personnel. For most activities at OU-3, a minimal decontamination procedure will be required.

8.2 VEHICLE AND EQUIPMENT DECONTAMINATION

During field activities, use of vehicles and small equipment is anticipated. The level of potential contamination at this site is "low" for equipment and support vehicles used in uncontaminated areas and/or for nonintrusive field activities in potentially contaminated areas.

8.3 APPAREL DECONTAMINATION

Single-use PPE clothing will be disposed in accordance with the site-specific Investigation-Derived Waste (IDW) Management Plan (Attachment D).

8.4 HAZARDOUS WASTE MINIMIZATION PRACTICES

Personnel working in controlled areas will work to minimize generation of hazardous waste. Disposal materials, wrapping, and packaging will not be brought into controlled areas unless required to prevent cross-contamination. Separate waste containers will be set up for trash, nonhazardous waste, and potentially hazardous waste.

8.5 TESTING REQUIREMENTS FOLLOWING DECONTAMINATION

The SSHR will inspect all items and equipment before they are transported from controlled areas for proper decontamination. Generally, visual inspection (after wet-wiping) of items used within controlled areas is sufficient, eliminating the need to test for chemical contamination.

8.6 CERTIFICATION OF DECONTAMINATION

A "certification of decontamination" will be prepared before releasing any government-furnished equipment from areas where field activities are conducted to uncontrolled areas. This requirement will not be implemented for field activities conducted after the property is transferred from the Department of the Navy to the designated transferee(s). The SSHR will maintain a decontamination record log for all other equipment on-site.

8.7 CONTRACTOR REQUIREMENTS

Contractors will notify the SSHR before removing equipment from controlled areas.

8.8 DECONTAMINATION AREA ARRANGEMENTS

A specific area has been designated within the site boundaries for waste storage, equipment decontamination, emergency supplies, and other necessary equipment (Figure 1-3).

A waste storage area will be established at the base for temporary storage of IDW as approved by the Safety and Health Manager (SHM). This area is limited to waste storage activities only. Any fieldwork that may cause the spread of contaminated IDW outside the waste storage area is prohibited.

Section 9
MEDICAL SURVEILLANCE

All field personnel will be required to participate in their employer's medical surveillance program before being permitted to work at the OU-3 site. The contractor selected to implement the LTM field program will be required to demonstrate, by document submittal, their maintenance of OSHA-compliant programs and to maintain records as required by the applicable contract. Specific exceptions to the medical surveillance requirements shall be identified in the site-specific supplement for site access by specialty contractors performing nonintrusive activity.

9.1 CONTRACTOR RECORDS

Contractor medical surveillance records are maintained by the contractor. Copies of records or a record summary will be maintained by each contractor at the work location.

All field personnel shall immediately inform the SSHR of any medical restrictions or any use of prescription drugs. If the employee desires confidentiality, this information may be forwarded directly to the SHM. Any physical limitations based upon a medical condition or prescription drug use will be evaluated by the contractor's medical consultant. Other work restrictions will be evaluated on a case-by-case basis by the SHM and the employer's safety office.

9.2 CONTRACTOR MEDICAL SURVEILLANCE SUBMITTALS

Contractors shall certify in writing that personnel have been medically qualified in accordance with OSHA standards. Contractors shall maintain on-site proof of medical qualification expiration dates, work limitations, and respirator-use approval by keeping copies of records or a records summary.

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Section 10
HAZARD MONITORING

During field activities, any potentially toxic air contaminants, explosive gas mixtures, and/or potentially hazardous noise levels will be monitored. Monitoring instruments to be used during site activities may include a PID or FID, colorimetric indicator tubes, an explosimeter fitted with the manufacturer's leaded gas filter, a real-time aerosol monitor, a sound-level meter, and/or a noise dosimeter. Table 10-1 summarizes instrument calibration and maintenance procedures.

10.1 CHEMICAL MONITORING

During sampling activities, monitoring will be conducted both at the wellhead or sampling port, and near workers' breathing zones. Table 10-2 summarizes the action levels for characterized compounds. Explosive gases may also be monitored at the wellhead or sampling port. Table 10-3 specifies the methods and frequencies for chemical monitoring.

10.2 ENVIRONMENTAL MONITORING

If contaminant exposures reach action levels in worker breathing zones and work continues (in Level "C" protection), perimeter monitoring will be conducted at the outer edge of the controlled area. If contaminants reach action levels in any perimeter area, work will be suspended until engineering controls or natural ventilation allows ambient area contaminant concentrations to fall below acceptable (action) levels.

10.3 AREA MONITORING

Direct-reading monitoring will be performed for detection of VOCs in air (see Table 10-2 for action levels). Direct-reading monitoring for metals in air is not feasible; therefore, a conservative action level for total dust will be used. Table 10-2 summarizes the action levels for known metals in dust and for unidentified mixtures of dust.

10.4 PERSONNEL MONITORING

Personnel monitoring will be initiated if the action levels for dusts and/or VOCs are equaled or exceeded (see Table 10-2) and/or if personnel are required to work using respiratory protection for periods of more than 1 hour.

Because summer temperatures may reach 100 °F at MCAS Tustin, workers should be monitored for heat stress (Tables 10-4 and 10-5).

Table 10-1
Instrument Calibration and Maintenance Information*

Instrument	Calibration Data
PID	Each day zero and span with ambient air and isobutylene standards. Adjust zero and span after lunch break or whenever zero appears to drift.
FID	Each day zero and span with ambient air and methane standards. Calibrate with a low-range and mid-range standard or calibrate at 10 ppm on both scales. Adjust zero and span hourly or whenever zero appears to drift.
Low-volume air sample pump	Calibrate with burette or auto calibrator both before and after sampling. Check flow during shift and at break.
Dust monitor	Determine background and response factor daily.
Combustible gas indicator	Calibrate daily with methane or gas mixture (nominal 50 percent lower explosive limit).
Ear-insertable core temperature monitor	Response check daily before work begins.
Dräger tubes and pump	Verify tubes are not expired. Test pump for leakage before use.

Note:
* specific manufacturer's procedures for maintenance and calibration will be followed before using any instrument in the field

Acronyms/Abbreviations:
FID – flame ionization detector
PID – photoionization detector
ppm – parts per million

Table 10-2
Monitoring Methods and Action Levels for Characterized[a] Mixtures Using Screening Survey Instruments

Hazard	Method	Action Level[b]	Protection Action
Total organic vapor	PID or FID	Background to 5 ppm above background	No action required
		> 5 ppm	Air-purifying respirator, full-face, Level C protection with organic vapor cartridges
		> 10 ppm	Air-purifying respirator, full-face, Level C protection, personnel monitoring required to identify contaminants
		> 50 ppm	Supplied air protection, Level B
		> 100 ppm	STOP WORK
Combustible gas	Explosimeter or FID	< 10% LEL	No action
		10 to 20% LEL	Start continuous monitoring; permit only classified electrical equipment and nonsparking tools
		> 20% LEL	STOP WORK, ascertain source of gas
Oxygen concentration	Oxygen analyzer	< 19.5% v/v	Leave area, evaluate reason for deficiency, monitor again remotely or with IDLH entry program
		19.5 to 20.5% v/v	Slight deficiency, continue continuous monitoring
		20.5 to 21.0% v/v	Normal range
		> 22.0% v/v	Elevated reading, check calibration, investigate cause, STOP any potential spark-producing activity

Notes:
[a] carcinogenic and highly toxic materials verified absent from atmosphere
[b] all action levels are readings observed above background

Acronyms/Abbreviations:
FID – flame ionization detector
IDLH – immediately dangerous to life or health
LEL – lower explosive limit
PID – photoionization detector
ppm – parts per million
v/v – volume per volume

Table 10-3
Chemical/Physical Monitoring Requirements
(low hazard)

Scope of Work Task	Chemical/Hazard	Instrument	Responsible Group	Initial Frequency
Working in direct proximity to motor vehicles	Noise	Sound-level meter/dosimeter	SSHR	Characterize the noise levels of the work area
Groundwater, LFG, and surface water sampling	Organic vapor	PID/FID	SSHR	Start of task, hourly, continuous if zone of contamination encountered
Decontamination of equipment	Organic vapor	PID/FID	SSHR	At SSHR discretion

Acronyms/Abbreviations:
FID – flame ionization detector
LFG – landfill gas
PID – photoionization detector
SSHR – Site Safety and Health Representative

Table 10-4
Action Levels for Heat Stress

Type Measurement	Action Level	Action
Ear insertable core temperature	100.4 degrees Fahrenheit or greater	Remove from work
Ear insertable core temperature	< 99 degrees Fahrenheit	Return to work

Table 10-5
Frequency of Physiological Monitoring for Fit and Acclimated Workers

Adjusted Temperature[a]	Normal Work Ensemble[b] After Each:	Impermeable Ensemble After Each:
90 °F (32.2 °C) or above	45 minutes of work	15 minutes of work
86.5 °F – 90 °F (30.8 °C – 32.2 °C)	60 minutes of work	30 minutes of work
82.5 °F – 86.5 °F (28.1 °C – 30.8 °C)	90 minutes of work	60 minutes of work
76.5 °F – 82.5 °F (25.3 °C – 28.1 °C)	120 minutes of work	90 minutes of work
72.5 °F – 76.5 °F (22.5 °C – 25.3 °C)	150 minutes of work	120 minutes of work

Notes:
[a] calculate the adjusted air temperature (Ta adj) with the following equation:
Ta adj(°F) = Ta(°F) + (13 × %sunshine / 100)
measure air temperature (Ta) with a standard mercury-in-glass thermometer with the bulb shielded from radiant heat; estimate the percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to attenuate shadow (100% sunshine = no cloud cover and a sharp, distinct shadow; 0% sunshine = no shadow)
[b] a normal work ensemble consists of coveralls or other cotton clothing with long sleeves and pants

Acronyms/Abbreviations:
°C – degrees Celsius
°F – degrees Fahrenheit

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Section 11
PERSONAL PROTECTIVE EQUIPMENT

Based on analytical results for soil, groundwater, LFG, and surface water samples collected and tested during previous investigations at OU-3, the anticipated level of PPE for most of the field activities will be Level D and modified Level D. Modified Level D will be required if splashes from chemicals or physical contact with contaminated groundwater are likely during groundwater sampling. Level C PPE will be required at any work site where the levels of contaminants exceed the action levels listed in Section 10.

As summarized in Table 11-1, Level D PPE includes:

- hard hat;
- safety glasses;
- normal work clothes, including long pants; and
- work boots.

In addition to the above-listed items, chemical-resistant gloves will be mandatory during all groundwater sampling activities.

Modified Level D PPE includes:

- Tyvek® or polyethylene-coated Tyvek suits, taped at the cuffs and at ankles;
- latex or nitrile gloves;
- hard hats;
- safety glasses; and
- overboots.

Level C PPE includes modified Level D PPE plus a full-face respirator with high-efficiency particulate air (HEPA) and organic vapor (OV) cartridges.

Table 11-1
Personal Protective Equipment
(potential or actual chemical exposure)

Task	Hazard	Level	Body	Respirator	Skin	Other
Groundwater, LFG, surface water sampling	Minimal chemical exposure	D or Mod. D*	Normal work clothes Long pants	Full-face with HEPA and OV ready for use	Latex or nitrile gloves	Hard hat Safety glasses
Decontamination of equipment, controlling spread of contamination	Skin contact	Mod. D	PE-coated Tyvek® suit	Full-face with HEPA and OV ready for use	Latex or nitrile gloves	Hard hat Safety glasses
Site inspections	Minimal chemical exposure	D	Normal work clothes Long pants		NA	Hard hat Safety glasses

Note:
* where the potential for heat stress exists, modified Level D may be downgraded to Level D if continuous monitoring verifies the absence of organic vapor

Acronyms/Abbreviations:
HEPA – high-efficiency particulate air (filter)
LFG – landfill gas
NA – not applicable
OV – organic vapor (filter)
PE – polyethylene

Section 12
HAZARD COMMUNICATION PROGRAM

If the DON or its contractors conduct LTM activities at OU-3, an OSHA-compliant hazard communication program will be implemented in accordance with PP SH 1.9, Hazard Communication Program (BNI 2003).

In the event that the Navy or its contractors do not conduct LTM activities at the site, the contractor selected to conduct the field activities shall implement an OSHA-compliant hazard communication program on-site. This program shall include a written program and an employee training program, and maintain records thereof. The hazard communication program should at a minimum include the following components:

- material safety data sheet availability
- labeling
- worker informational program
- employee training

The details of the hazard communications program will be provided in this SSHP by the contractor selected to perform the LTM activities before commencing fieldwork.

Material Safety Data Sheets for all chemicals used on-site will be available from the SSHR along with the written program.

Environmental samples of groundwater, LFG, and surface water from the OU-3 site are not expected to meet contamination criteria that would require implementation of special training, packaging, and shipment, in accordance with Department of Transportation requirements. In the unlikely event that sample results indicate levels of contaminants meeting these criteria, shipment of further samples will be discontinued until the appropriate training is conducted and special shipping arrangements are made.

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Section 13
RESPIRATORY PROTECTION PROGRAM

If the Navy or its contractors conduct O&M activities at OU-3, the respiratory protection program will be implemented in accordance with applicable regulations and PP HS 3.1, Respiratory Protection (BNI 2003). Based on the low hazard evaluation at the site, the use of respiratory protection during field activities is not anticipated.

In the event that the Navy or its contractors do not conduct O&M activities at OU-3, the contractor selected to implement the LTM field activities at the site shall implement an independent respiratory protection program for its personnel. This respiratory protection program shall be in accordance with applicable regulations and at a minimum should contain the following components:

- respirator selection
- medical surveillance
- respiratory protection training
- respirator fit testing
- respirator cleaning, inspection, and maintenance
- respirator cleaning supplies

Contractors shall maintain current fit-test certificates and medical certifications for each employee. Contractors shall provide buddy, standby, and rescue personnel when required for special operations.

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Section 14
TRAINING ASSIGNMENTS

A matrix summarizing training requirements for field personnel, contract supervisors and personnel, visitors, and vendors is presented in Table 14-1.

Table 14-1
Training Assignment Matrix

Category	40-Hour Basic	8-Hour Refresher	24-Hour Supervised Experience	Site-Specific	First Aid/CPR[a]
Employee	X	X	X	X	X
Contractor Supervisor	X[b]	X[b]	X	X	X
Contractor	X[b]	X[b]	X	X	X
Visitor	X[c]	X[c]	X[d]	X	
Vendor	X[c]	X[c]	X[d]	X	

Notes:
[a] a minimum of two people will be on-site, at a given field location during fieldwork, who have a valid certificate in basic first aid/CPR from the American Red Cross (or equivalent) documented training
[b] the requirement for 40-hour basic and 8-hour refresher training for contractors will be made on a case-by-case basis by the SHM
[c] for vendors/visitors requiring controlled area access to work on contaminated equipment
[d] not required if escorted

Acronyms/Abbreviations:
CPR – cardiopulmonary resuscitation
SHM – Safety and Health Manager

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Section 15
SUBCONTRACTOR REQUIREMENTS

This section outlines documentation requirements for subcontractors to the contractor selected to conduct LTM activities at OU-3.

15.1 COMPANY REQUIREMENTS

The subcontractor representative of the contractor selected to perform LTM activities at the site will provide the documents listed below to the Navy and the city of Tustin or the designated property transferee in advance of site work. Many of these documents are also required to be available on-site. This requirement is indicated where applicable. The documents are as follows:

- written designation of the competent person for excavation, trenching, etc., as required
- written designation of the Safety and Health Coordinator and Alternate Safety and Health Coordinator
- designation of the company Safety and Health Official or Manager
- copies of the subcontractor safety and health plan for the site and standard operating procedures applicable to site work (these documents are also required at the work site; the subcontractor plan must be at least as conservative as the CLEAN SSHP)
- copies of the subcontractor Safety and Health Program, Injury and Illness Prevention Program, Code of Safe Work Practices, as applicable (these documents are also required at the work site)
- a copy of the subcontractor Respiratory Protection Program, Medical Surveillance Program, Employee Exposure Records Maintenance Program, Hazard Communication Program, Emergency Plans, Lockout/Tagout Program, Confined Space Entry Program, and any other OSHA-required program documents applicable to the work scope (applicable documents are also required at the work site)
- material safety data sheets and product names index for all products brought on-site (these documents are also required at the work site)

In addition to the above documents, the following items need to be maintained on-site:

- on-site documentation of inspection and certification by a competent person of equipment safe operating condition for each item of machinery or mechanized equipment
- on-site manufacturer instructions or operating procedures for each item of machinery or mechanized equipment
- personnel documentation as required in Section 15.2

15.2 PERSONNEL DOCUMENTATION REQUIREMENTS

All personnel will be required to have available on-site either the documents listed below or a certified report showing the names and dates when the requirement was last completed if actual copies of certificates can be produced within 24 hours upon request:

- physician's statement for hazardous waste site work
- physician's statement for respirator use, if such use is contemplated
- respirator fit-test certificate (for each model and size that may be required)
- statement of 3 days' supervised field experience on a hazardous waste site
- training course certificate, 40 (or 24) hours
- refresher training course certificate (after 1 year from initial training)
- first aid/cardiopulmonary resuscitation (CPR) training certification, if required, based upon site-specific needs
- respirator training certificate for special devices
- employer's certification that the employee has completed training to a level required by job function and responsibilities

Section 16
EMERGENCY RESPONSE

The emergency response plan (ERP) presented in this section is intended to be used for emergencies that may occur at the site during LTM and O&M field activities. In addition, this ERP was prepared to be used in the event that emergencies or natural disasters occur when the site is unoccupied. This ERP was prepared to provide contact and reporting information and emergency facilities locations necessary in the event that an emergency such as fire, earthquake, flooding, or failure or collapse of the containment wall should occur at the site.

Before implementing the OMP, or in the event that LTM activities and responsibilities are transferred between entities, the contractor selected to conduct LTM field activities at the site will update the emergency contact information presented in this section. The emergency contact information to be updated includes Table 16-1, which lists pertinent emergency phone numbers; Table 16-2, which lists emergency facilities locations; Table 16-3, which lists site and program emergency notification contacts; and Figures 16-1 and 16-2, which show the emergency evacuation route and the route to the nearest hospital, respectively. All field vehicles will maintain a copy of this section (Section 16) together with the appropriate emergency maps at all times, in a readily accessible location.

In the event of a medical emergency, natural disaster, or fire during fieldwork at OU-3, field personnel will call the standard **"911"** emergency telephone number from the on-site mobile phone.

A mobile telephone will be available during all field activities. On a daily basis, and at each work location, the SSHR and/or field team leader will verify that mobile phones are operational.

The emergency facility located closest to OU-3 is the Western Medical Center. The hospital address is 1001 N. Tustin Avenue in Santa Ana (Figure 16-2). As shown on Figure 16-2, the route from OU-3 to the hospital is as follows.

> Exit OU-3 at Edinger Avenue. Turn *west* on Edinger Avenue and then *right* onto Highway 55. Go north on Highway 55 and exit at Irvine Boulevard. Turn *left* and proceed to Tustin Avenue. Turn *right* on Tustin Avenue. The hospital is on the right.

16.1 EMERGENCY EQUIPMENT

Spill cleanup and control supplies (one kit) will be maintained in ready condition at the central staging area.

16.2 COMMUNICATIONS

Readily accessible communication devices including an emergency alerting signal (e.g., an automobile horn or a portable air horn) will be maintained on-site during field activities. Communication devices will be tested at least once per shift and at each new work location. The SSHR will always have a radio or phone in his/her possession. At least one working mobile phone is required on-site at all times during field activities.

Table 16-1
Emergency Phone Numbers*
(to be posted by Site Safety and Health Representative at all phone locations)

Emergency	Number	Contact	Notes
Medical	911	Emergency operator	
Fire	911	Emergency operator	
Police	911	Emergency operator	
Duty Officer	TBD	To be determined	Most likely a city of Tustin number for personnel responsible for coordinating emergency activities
Medical Center	(714) 835-3555	Western Medical Center Emergency Room 1001 N. Tustin Avenue Santa Ana, CA 92705-3577	

Note:
* emergency contact information presented in this table will be updated before implementing the operation and maintenance plan, or in the event that long-term monitoring activities and responsibilities are transferred between entities

Acronym/Abbreviation:
TBD – to be determined

Reporting an Emergency:

When calling for assistance in an emergency situation, the following information should be provided:

- name of the person making the call
- telephone number at the location of the person making the call
- name of the injured person (if known)
- nature of incident
- actions already taken
- location of the incident
- what assistance is needed

IMPORTANT! DO NOT HANG UP UNTIL THE OPERATOR HAS ALL THE INFORMATION NEEDED.

Table 16-2
Emergency Facilities Locations*

Facility	Nearest Location	Alternate Location
Safety shower	Not required	Not applicable
Portable deluge	Each work area	Support vehicle
Decontamination area	Each group of sites	Support vehicle
Eyewash	Each work area	Support vehicle
First-aid kit	Each work area	Support vehicle
Other emergency supplies	Site staging area	Investigation-derived waste storage area
Emergency oxygen	Not required	Not applicable
Fire extinguishers	Subcontractor vehicles	Waste storage area

Note:
* emergency contact information presented in this table will be updated before implementing the Operation and Maintenance Plan, or in the event that long-term monitoring activities and responsibilities are transferred between entities

Table 16-3
Site and Program Emergency Notification Contacts*

Contact	Telephone
Resident Officer In Charge of Construction, (to be updated)	To be determined
Project Manager, Tim Heironimus	(619) 744-3004
Contract Task Order Leader, Jim Callian	(619) 744-3061
Safety and Health Supervisor, Jon Gilbert	(619) 744-3049
Site Safety and Health Representative, Ron Prince	(949) 857-6352
Remedial Project Manager, Marc Smits	(619) 532-0793
Bechtel Environmental, Inc , San Diego Office	(619) 687-8700
Kleinfelder, San Diego Office	(858) 320-2231
Brown and Caldwell, San Diego Office	(858) 514-8822
Safety and Health Manager, Jon Gilbert	(619) 744-3049

Note:
* emergency contact information presented in this table will be updated before implementing the operation and maintenance plan, or in the event that long-term monitoring activities and responsibilities are transferred between entities

16.3 EMERGENCY RESPONSE PLAN

This section has been developed in accordance with 27 CCR Chapter 3, Section 21130, which requires the Navy to prepare and maintain a written postclosure ERP as part of the LTM plan. An ERP identifies those occurrences that may exceed the design of the landfill cap and/or containment wall and endanger public health or the environment. A contingency plan presented in Section 6 of the OMP identifies appropriate contact personnel and their responsibilities in the event that an emergency response is required at the site.

As required in 27 CCR, Section 21130, this ERP will be amended under the following conditions:

- whenever a failure or release occurs for which the plan did not provide an appropriate response
- if there is a change in postclosure use
- if maintenance and inspection requirements change during the LTM period

Amendments and modifications will be provided in the form of addenda and submitted to the California Regional Water Quality Control Board (RWQCB), Santa Ana Region, the California Integrated Waste Management Board (CIWMB), and the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC).

One copy of this plan will be available on-site. Additional copies of this plan will be available for viewing at the following locations:

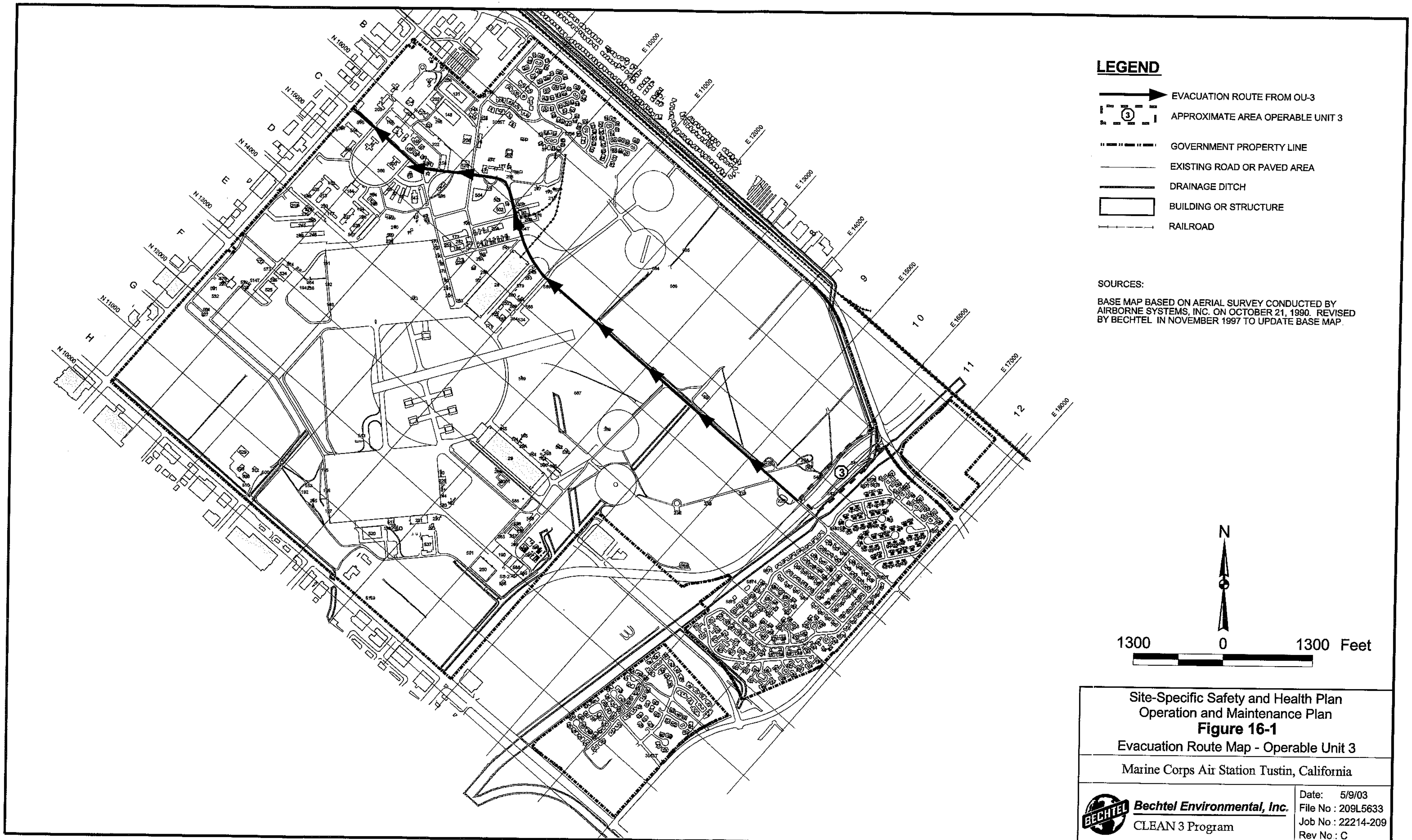
Location	Information Repository University of California at Irvine (UCI), Main Library Government Publications Department
Address	The UCI Libraries – ZOT 810
City, State	Irvine, California 92623-9557

and

Location	The City of Tustin
Street Address	300 Centennial Way
City, State	Tustin, California 92780

16.3.1 Introduction

This section describes the site covered by the ERP, the scope of Emergency Response Officer (ERO) duties, and equipment needed for repairs. The ERO will be identified before implementing OMP field activities and will be responsible for contacting appropriate agencies in the event an emergency response is required at the site.

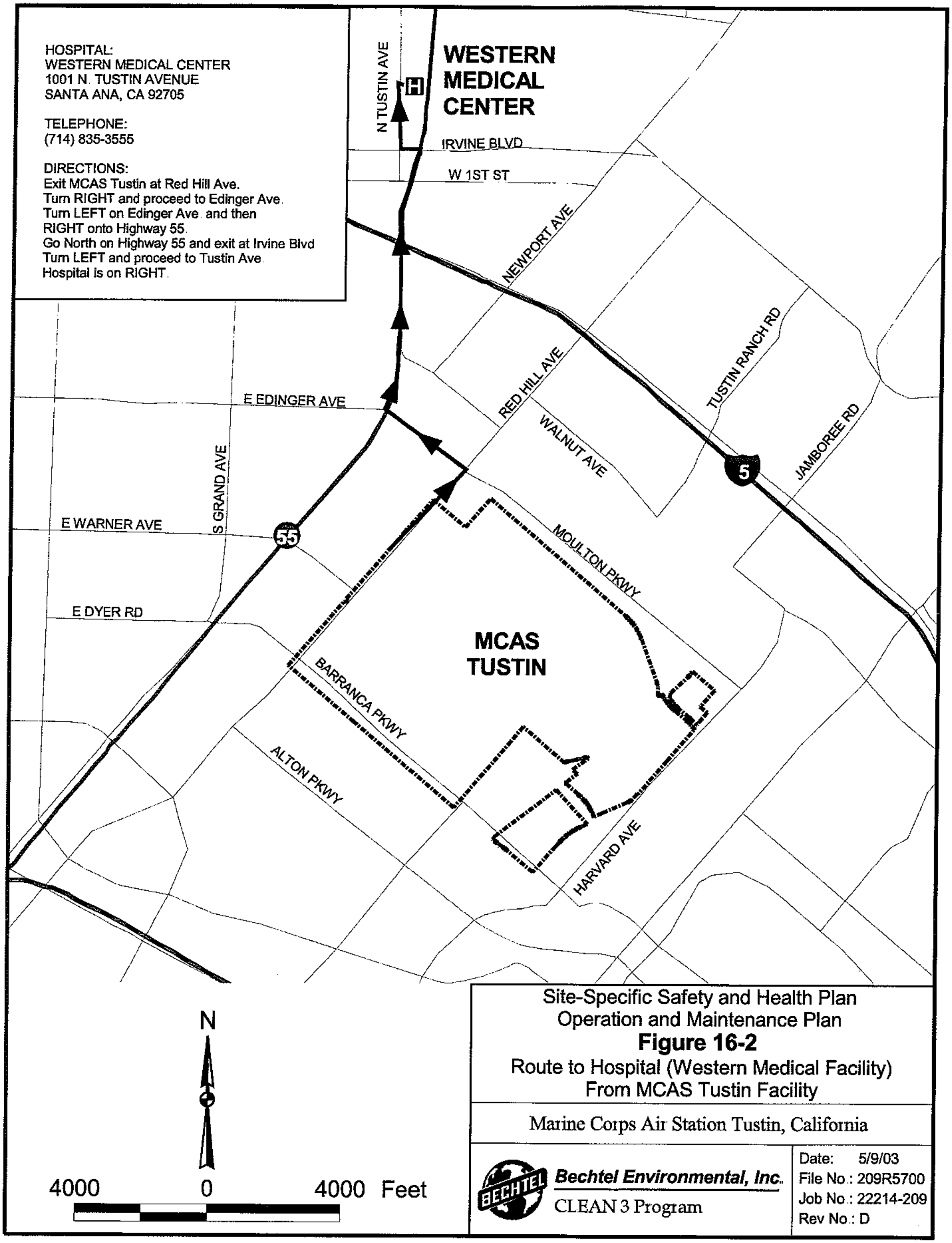


Site-Specific Safety and Health Plan
Operation and Maintenance Plan
Figure 16-1
Evacuation Route Map - Operable Unit 3

Marine Corps Air Station Tustin, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 5/9/03
File No : 209L5633
Job No : 22214-209
Rev No : C



Site-Specific Safety and Health Plan
Operation and Maintenance Plan

Figure 16-2

Route to Hospital (Western Medical Facility)
From MCAS Tustin Facility

Marine Corps Air Station Tustin, California

Bechtel Environmental, Inc.
CLEAN 3 Program

Date: 5/9/03
File No.: 209R5700
Job No.: 22214-209
Rev No.: D

16.3.1.1 SITE LOCATION

OU-3 is located in Orange County, California, approximately 40 miles south of downtown Los Angeles and more than 100 miles north of the California/Mexico border.

OU-3, including the Moffett Trenches and Crash Crew Burn Pits, is in the northeastern corner of MCAS Tustin. The site is situated along the western bank of Peters Canyon Channel, approximately 700 feet north of Moffett Drive. The site is bounded to the east by Peters Canyon Channel, to the north by Edinger Avenue, to the south by Moffett Drive, and to the west by agricultural land.

16.3.1.2 EMERGENCY RESPONSE OFFICER AND RESPONSIBILITIES

The determination that an emergency has occurred and that corrective actions need to be implemented must be made by an individual having the authority and training to supervise and direct the emergency response. This individual will be designated the ERO. The ERO for OU-3 will be designated before implementing the OMP. The ERO will be selected based on his or her ability to respond quickly to an emergency at the site as well as meeting the other requirements stipulated in the ERP. The ERO is responsible for:

- communicating with the appropriate regulatory agencies whenever an emergency occurs;
- assuring that required documentation is forwarded to the appropriate regulatory agencies, either for their approval or their files, as appropriate;
- appending and modifying this ERP as necessary; and
- additional items as described in this ERP.

All inspectors, maintenance crews, visitors, and other personnel who enter the site are subject to the provisions of this plan. They must read this ERP and be familiar with its provisions.

This is an ERP, not a Safety and Health Plan. Each team entering the site will be responsible for the safety and health of its own employees. All contractors must comply with the applicable OSHA standards.

In the event of an injury or illness requiring emergency medical care, the following resources can be used:

Western Medical Center (Figure 16-2)
1001 N. Tustin Boulevard
Santa Ana, California 92705-3502
(714) 835-3555

Fire Rescue (Paramedics)
911

When calling for assistance in an emergency situation, the following information should be provided:

- name of person making the call
- telephone number at the location of the person making the call
- name of injured person (if known)
- nature of incident
- actions already taken
- location of incident
- what assistance is needed

16.3.1.3 EQUIPMENT

Arrangements for equipment required for emergency repairs should be made through the ERO. Generally, this equipment is limited to bulldozers, scrapers, and graders for grading and excavation activities, and sheepsfoots for compaction activities. Additionally, a water truck may be necessary for dust control.

16.3.2 Employee Training

Emergency personnel shall have completed the 40-hour safety training requirements in accordance with 29 CFR, Section 1910.120, Hazardous Waste Operations and Emergency Response.

Daily safety briefings will be held before work activities, and all on-site personnel are required to attend. Topics of discussion and attendance will be documented.

16.3.3 Potential Hazards and Corrective Actions

The OU-3 area of investigation formerly consisted of unlined, shallow landfill trenches and pits constructed to burn flammable liquids for firefighter training exercises. The exact number and size of the trenches and pits are unknown, and some trenches and pits were constructed over older sections of the trenches. The area covered by the landfill trenches and burn pits has been estimated from aerial photographs and historical information as approximately 600 by 250 feet. Other subsurface features at the site include a "fishbone-style" French drain system.

Events that may require implementation of corrective-action measures include vandalism, fires, explosions, LFG accumulation, earthquakes, floods, collapse or failure of the containment wall, surface drainage problems, and waste releases. Of these events, vandalism, fires, earthquakes, and floods are more likely to occur at OU-3. In the event that an emergency response is required at the site, the contingency plan should be referenced to determine which personnel and agencies should be notified. Agencies and personnel may be required to be notified to perform site visits, evaluate the condition of the site, determine appropriate mitigation measures to be implemented if any, and determine the effectiveness and/or to approve any mitigation measures implemented.

16.3.3.1 VANDALISM

Vandalism is defined as the willful or malicious destruction or defacement of public or private property.

In the event of vandalism, the following corrective measures will be performed.

1. The ERO will be notified.
2. The ERO will inspect and evaluate damage and loss.
3. If necessary, the ERO will:
   - section off the area that may pose a safety hazard; and
   - take corrective action (e.g., notify police or repair site fencing), dependent on the situation.

16.3.3.2 FIRE AND EXPLOSION

Fire or explosions may be caused by ignition of brush or in extreme circumstances by LFG accumulation in excess of the lower explosion limit. Unless the ERO and on-site equipment operator have training and experience in creating emergency firebreaks or other applicable fire-fighting techniques, on-site personnel shall not engage in fire-fighting activities other than the following:

1. Immediately report any occurrences of fire or explosion to both the ERO and the local fire department regardless of on-site capabilities.

   Fire Department: 911

   ERO: To be determined
2. Section off an area not less than 250 feet from the incident.
3. If appropriate, use a hand-operated fire extinguisher for grass fires.

An inspection and evaluation of the damage to the cover will be performed when it has been determined that the fire is no longer a threat (at least 12 hours after extinguishing the fire). The ERO will notify DTSC and the city of Tustin or the designated property transferee of site conditions resulting from fire or explosion. If necessary, the ERO will make arrangements to hire a contractor to reconstruct and repair the damaged landfill final cover. If reconstruction is to be performed, the cover shall be reconstructed in accordance with the final design drawings and technical specifications, and the construction quality assurance/quality control plan requirements used during the construction of the original cover.

The CIWMB, RWQCB, DTSC, and the city of Tustin or the designated property transferee will be notified upon completion of all necessary repair work to the cover system to assure the final remedy has not been adversely affected by fire or explosion.

16.3.3.3 EARTHQUAKES

Earthquakes can cause slope failures and damage to drainage structures. If slope failures and drainage system damage (as a result of an earthquake) threaten the integrity of the waste cover system or containment wall, they must be considered for immediate emergency repairs. Minor loss of soil cover, minor soil creep, limited and local settling, or other damages can be repaired on a nonemergency basis in the course of normal site maintenance.

In the event of an earthquake, the following corrective measures will be performed.

1. During earthquakes, on-site employees should exit equipment and vehicles and go to the main entrance (Figure 16-1). Before implementation of the OMP, or after the property is transferred, this emergency meeting location will be evaluated and reestablished as necessary.
2. If necessary, the fire department should be contacted immediately.
3. Following an earthquake, the ERO will inspect and make an evaluation of damages sustained.
4. The ERO will contact the Orange County Flood Control District and DTSC.
5. The ERO will decide whether damages to the cover system, surface drainage systems, or containment wall need to be repaired immediately using contracted personnel and equipment. If necessary, the ERO will make arrangements to hire a contractor to repair or reconstruct the landfill cover and/or containment wall. Repairs that may be made to the containment wall may include grouting behind the wall to contain groundwater. If reconstruction is to be performed, the cover and/or containment wall will be reconstructed in accordance with the final design drawings and technical specifications and the construction quality assurance/ quality control plan requirements used during the construction of the original structure.
6. The ERO, in conjunction with the Navy and regulatory agencies, will conduct inspections and approve any reconstruction or repairs that may be made to the cover system and/or containment wall.

16.3.3.4 FLOODS

Flooding or washouts of the containment wall, berms, riprap, and drainage ditches or excessive damage to the landfill cover could occur as a result of an extreme weather event. Because of the potential for severe and forceful stormwater flow through the Peters Canyon Channel, the east side of the landfill (containment wall) is the most susceptible to flooding, inundation, and washout. Repairs will be coordinated by the ERO.

In the event of a flood, the following corrective measures will be performed.

1. Following the flooding event, the ERO will inspect and make an evaluation of damages sustained.

2. If necessary, a temporary diversion channel will be constructed to avoid infiltration of the floodwater into the landfill.

3. Sandbags can be used in conjunction with the diversion channels to avoid infiltration into the landfill.

4. The ERO will notify the Navy, the Orange County Flood Control District, the city of Tustin or the designated property transferee, and the OCHCA of any temporary measures taken to mitigate any negative impacts resulting from flooding.

5. The ERO, in consultation with the city of Tustin and appropriate agencies, will decide whether damage to the cover system and/or containment wall needs to be repaired immediately using contracted personnel and equipment. If necessary, the ERO will make arrangements to hire a contractor to reconstruct the landfill cover and/or containment wall. If reconstruction is to be performed, the cover and/or containment wall shall be reconstructed in accordance with the final design drawings and technical specifications and the construction quality assurance/quality control plan requirements used during the construction of the original structure.

6. The ERO, in conjunction with the Navy and regulatory agencies, will conduct inspections and approve any reconstruction or repairs that may be made to the cover system and/or containment wall.

16.3.3.5 FAILURE OR COLLAPSE OF THE CONTAINMENT WALL

The ERO shall hire a contractor, on a stand-by basis, to perform necessary emergency repairs to the steel-reinforced concrete containment wall at the site in the event of catastrophic failure or collapse. The contractor shall be familiar with the present construction and technical specifications of the containment wall and be able to perform any necessary repairs in a timely manner.

In the unlikely event that the steel-reinforced concrete containment wall at the site fails or collapses due to some catastrophic event, the ERO will implement the following corrective measures.

1. Following the failure event, the ERO will inspect and make an evaluation of the damages sustained. The assessment will include possible environmental and human-health hazards from the release including inhalation exposure and water runoff.

2. If necessary, temporary berming may be used to contain any soil that breaches the containment wall.

3. The ERO will notify the appropriate agencies including the Navy, DTSC, RWQCB, the city of Tustin or the property transferee, the Orange County Flood Control District, and the OCHCA of the condition of the containment wall and any temporary emergency measures taken to mitigate the effects of the containment wall failure.

4. The ERO, in consultation with the Navy and regulatory agencies, will decide whether damage to the containment wall needs to be repaired immediately using contracted personnel and equipment. If necessary, the ERO will make arrangements to hire a contractor to repair and/or reconstruct the containment wall. If reconstruction is to be performed, the containment wall shall be reconstructed in accordance with the final design drawings and technical specifications and the construction quality assurance/quality control plan requirements used during the construction of the original structure.

5. The ERO, in conjunction with the Navy and regulatory agencies, will conduct inspections and approve any reconstruction or repairs that may be made to the containment wall.

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Section 17
FIRST AID PLAN

This section presents the first aid plan and discusses controls for exposure to bloodborne pathogens.

17.1 GENERAL

During fieldwork, at least two people will be on-site who have a valid certificate in basic first aid/CPR from the American Red Cross or equivalent, documented training. The SHM may reduce this requirement to one person when on-site facilities are immediately available.

Subcontractors are responsible for training their employees. Each subcontractor will be required to provide one first aid/CPR-qualified individual on each shift; however, if a subcontractor is working alone, two qualified personnel shall be available. This requirement may be met if two sites are within 1/2 mile of each other and communications are in place.

First aid kits will be maintained by each subcontractor. A 5-gallon supply of emergency deluge water shall be available and reserved for emergency use. Each subcontractor shall maintain at each work location at least two eyewash bottles (1-quart capacity each) available for immediate use. The SSHR shall periodically verify that the first aid supplies are available

Qualified field personnel may use the first aid kits to administer first aid to any injured workers. The SSHR shall verify daily that first aid-/CPR-qualified personnel are on-site. Unqualified personnel should only use the first aid kits to assist others in an emergency when qualified personnel are not available.

When responding to serious personnel injuries, the SSHR will contact the appropriate authorities (e.g., fire department, a physician, paramedics, or police).

Severely injured personnel will be transported to the hospital by ambulance service. Site personnel will transport injured persons to the hospital only if ambulance service is not readily available.

Treatment of workers injured in an area controlled because of hazardous chemicals or hazardous wastes shall be in accordance with appropriate first aid procedures. Life-saving care shall be provided immediately, without consideration of decontamination requirements. In the presence of strong acid or caustics, caregivers shall don appropriate protection

17.2 BLOODBORNE PATHOGENS EXPOSURE CONTROL

All personnel should be aware of the potential for transmission of disease from contact with bodily fluids. It is assumed that all bodily fluids are potentially infectious, and appropriate precautions should be used. The following controls are to be considered:

- use the victim's hand to control initial bleeding
- use available protective gear (Tyvek gloves) to prevent contact

- promptly wash after contact with body fluids
- use rescue breather for CPR

Section 18
FIELD SAFETY PLAN

This section presents the field safety plan, including general safety rules, forbidden practices, fire safety, and sanitation.

18.1 GENERAL

The contractor selected to perform LTM field activities will abide by all appropriate and applicable safety requirements, similar to those defined in PP SH 5.1, Field Safety Program (BNI 2003). This procedure and the reference documents listed in Section 1.2 provide a complete list of safety requirements. Section 18.3 includes an abbreviated list of safe-work practices.

18.2 INSPECTIONS

Frequent and regular safety and health inspections shall be conducted at each work site. The SSHR inspects the workplace daily. Each inspection shall be documented in the SSHR daily logs along with corrections of safety violations. This documentation shall be included in the site closeout report.

In addition to the daily inspections performed by the field team, the safety and health staff shall perform frequent inspections of fieldwork sites to assure compliance with applicable requirements. Safety and health staff inspections shall similarly be documented and deficiencies tracked until documented closure of site activity.

18.3 GENERAL SAFETY RULES

The following safe-work practices will be enforced at the site.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material will be prohibited in any area where the possibility of contamination exists.
- Face and hands will be washed upon leaving a contaminated or suspected contaminated area before eating, drinking, or any other activities transpire.
- Legible and understandable precautionary labels will be affixed to containers of scrap, waste, debris, and contaminated clothing.
- Contaminated protective clothing will not be removed from the controlled area until it has been cleaned or properly packaged and labeled.
- All wastes generated from project activities (e.g., soiled PPE, decontamination waste) will be contained and disposed as specified in the IDW Management Plan (Attachment D).
- Excessive facial hair, which interferes with a satisfactory fit of the mask-to-face seal, will not be permitted.

- Contact with potentially contaminated substances will be avoided. Personnel will not walk through puddles, pools, or mud; kneel on the ground; lean or sit on equipment; or place monitoring equipment or tools on contaminated surfaces.
- Personnel will not be permitted to wear contact lenses within a controlled area, except when medically required.

18.4 FORBIDDEN PRACTICES

The following practices will be strictly forbidden during any work in controlled access areas:

- horseplay
- fighting
- eating
- drinking, except in authorized break areas
- smoking
- chewing gum, tobacco, or any other substances
- use of facial cosmetics other than prescription medication, sunscreen, or preparations used on the advice of a physician
- unnecessary sitting or kneeling on contaminated surfaces
- placing equipment on contaminated surfaces (when practicable)
- climbing on or over obstacles
- starting or maintaining an open flame of any type unless authorized by the SSHR
- entering the work site with safety equipment that has not been determined to be in proper working condition immediately before entry
- entering the work site, under any circumstances, by any employee or visitor without prior approval

In addition to the forbidden practices, the SSHR may impose other prohibitions that may be required for safe operations.

18.5 FIRE SAFETY

All site personnel will comply with all applicable fire-safety rules. All personnel shall be informed of the location of the nearest fire alarm box and the local fire-reporting telephone number.

The following general fire-safety rules should be known and understood by all personnel on the project site.

- Smoking is permitted only in authorized and posted smoking areas.
- Strike-anywhere matches are prohibited on-site.
- A permit is required before engaging in any spark-producing activity (e.g., welding, cutting, grinding).
- Each vehicle will carry a 3A:40BC-type fire extinguisher.
- Lay-down areas for materials will be approved before use.
- Approval to block roads, park heavy machinery or equipment, or set up drill rigs shall be obtained in advance.
- Oily rags shall be stored in closed metal containers approved for this purpose.
- Flammable and combustible liquids shall be handled only in approved safety cans.
- All personnel shall know the area escape route and alternate route.

18.6 SANITATION

Sanitation for fieldwork includes potable water, toilets, washing facilities, and waste disposal.

18.6.1 Potable Water

The Site Health and Safety Officer shall assure that cool, bottled water and disposable cups are available at all remote sites. Electrolyte-replacing fluids may also be required, depending upon the SSHR, Safety and Health Supervisor, or SHM evaluation. Bottled water shall be provided with a sanitary tap. Garden hoses are not an acceptable source of drinking water. Nonpotable water shall be marked "nonpotable, unfit for drinking, washing, or cooking."

18.6.2 Toilets

Where employees do not have immediate access to available vehicles, temporary toilets shall be provided within a 5-minute walk. During activities in which provision of toilets is not practicable, such as reconnaissance or short-term mobile field activities, this requirement may be waived by the SHM.

18.6.3 Washing Facilities

Washing facilities with hot and cold (or tepid) running potable water shall be provided at each decontamination area. Running water may be provided by either gravity flow, pressure, or manual pump. Soap and disposable towels shall also be provided.

18.6.4 Waste Disposal

Waste receptacles shall be marked for their intended purpose and type of waste. All waste receptacles shall have a tight-fitting cover.

18.7 ILLUMINATION

Illumination for night work shall meet OSHA standards.

18.8 HOUSEKEEPING

The SSHR shall inspect all work areas daily for adequate housekeeping, and inspection results shall be recorded on the SSHR daily log. The following housekeeping requirements shall be met at all times.

- All passageways and routes of access shall be kept clear of obstructions, cables, or hoses.
- Empty bags of loose dust-producing material (e.g., cement, bentonite, lime) shall be removed daily.
- Combustible materials shall be properly stored.
- All spills of fuel, oil, solvents, or other flammable, dangerous, or toxic material shall be cleaned up immediately and the spoils placed in containers marked as hazardous.
- Brush, long grass, or other materials that may present a fire hazard shall be cleared before motorized equipment is used.
- Excess scrap material and rubbish shall be promptly removed from the work area.
- PPE shall be returned to the designated storage area at the end of the work period or shall be placed in designated disposal receptacles.

Section 19
VISITOR ACCESS REQUIREMENTS

Site visitors are defined as those who are not employed at the project site, do not routinely enter restricted work areas, and will be within controlled areas only for brief periods. Visitors may or may not be required to meet all aspects of the safety and health program, based upon their duties and potential exposures. Visitors may include government inspectors, vendors, repair personnel, and governmental officials. Policies and procedures necessary to protect visitors are discussed in SSHPs.

19.1 GENERAL REQUIREMENTS

The following requirements apply to visitors whose purpose is to observe site conditions or field activities.

- The SSHR will be notified of the nature and duration of the visit before visitors are permitted to enter a restricted work area.
- The visitor's log will be completed, including the individual's name, the date, and the name of the company or agency represented.
- The site visitor will be escorted by a representative of the contractor selected to perform LTM activities at all times while in restricted work areas of the site. The SSHR or designee will escort visitors whenever restricted work areas are entered.
- Visitors will comply with specific safety and health requirements described in the following subsections, when applicable.

Table 14-1 shows training requirements.

19.2 MEDICAL SURVEILLANCE

Each visitor will be required to provide proof of participation in an occupational health program if access is necessary into a controlled area where respirator use is required. A visitor who cannot provide a physician's statement or other acceptable documentation stating that he/she is medically qualified to work with hazardous materials and to wear a negative-pressure respirator will be restricted from entry.

19.3 TRAINING REQUIREMENTS

All visitors, even if escorted, must be briefed on the SSHP (e.g., potential hazards and safety procedures) before entering restricted work areas. See Table 14-1 for requirements.

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Section 20
PERSONNEL REQUIREMENTS

All personnel assigned to work on this project are expected to read and be familiar with the SSHP and their company safety requirements.

The individual personnel expectations set forth below are included in each SSHP.

- All personnel are expected to fully comply with all rules and regulations set forth in the above documents.
- All personnel are expected to report to work, be ready to work, and be free from the influence of alcohol, illegal or controlled substances, or prescription or nonprescription pharmaceuticals that may affect their ability to work safely.
- All personnel shall report to work with all safety gear required for anticipated tasks.
- All personnel are required to report all injuries and incidents, even if considered minor.
- All personnel are required to comply with the buddy system requirements within controlled access areas.
- All personnel are required to follow the direction of the SSHR on safety or health matters, stop-work orders, or emergency evacuations.
- All personnel will be required to sign an acknowledgment of training received on the project and an agreement to follow all rules and regulations.
- Eating, drinking, smoking, chewing, etc., will not be tolerated in controlled areas.

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Section 21
SPILL PREVENTION AND CONTROL MEASURES

This section discusses spill prevention, control, and containment and emergency response in the event of a spill.

21.1 SPILL PREVENTION, CONTROL, AND CONTAINMENT

Chemicals or hazardous substances could be spilled during site tasks as a result of:

- transportation accidents;
- improper packaging practices;
- rupturing of tanks, drums, or other storage containers; or
- improper handling of hazardous materials during off-loading.

The emergency plan will be activated in the event of unplanned spills of hazardous or unknown substances. In the event of any spill at the site, the field team leader and SSHR are to be notified immediately by whoever first witnesses the emergency event.

21.1.1 Facility and General Prevention/Control Measures

The following specific spill prevention and control measures include procedures to be implemented in the field by field personnel to reduce the possibility of liquid waste spillage, as well as actions to be taken if a spill occurs.

Preventive Measures

Preventive measures include the following activities.

- Inspect 55-gallon drums, bins, and/or Baker tanks for visible defects (e.g., holes, corrosion) upon delivery to the site.
- Inspect all 55-gallon drums upon delivery to the site to assure that each drum includes a resealable lid or a resealable lid with a small resealable sampling port (bung) near the top, on the side, or on the lid and that the closure is not deformed or distorted.
- Set the 55-gallon drums on wooden pallets to facilitate transport via forklift (if necessary).
- Transfer contents of 55-gallon drums to a double-walled Baker tank located in the equipment compound prior to concluding each work period.
- Perform inspections of the storage area including 55-gallon drums, bins, and/or Baker tanks while being filled and immediately after relocation to a temporary on-site storage area to check for possible leaks.
- Select flat areas for temporary storage away from high-traffic zones and storm or sewer drains.

Spill Containment and Control

The following actions will be taken by field personnel assigned to the field activities in the event of a spill.

- The site coordinator (field team leader) and SSHR are to be notified immediately.
- Workers not involved in spill containment and/or cleanup will evacuate the immediate area to reduce the likelihood of spreading contamination or being exposed to contamination.
- Designated emergency response personnel attired in SARANEX® coveralls and Level C PPE (if applicable) will proceed to the spill area with a spill cleanup and control kit that includes absorbent materials.
- Attempts will be made to stop the source(s) of spillage immediately.
- The SSHR will monitor for exposure to chemicals or hazardous substances during spill cleanup work.
- The SSHR will stay at the spill area until the area has been cleared, inspected, and readied for reentry.
- The SSHR will prepare a spill incident report.
- If the spill is of known or potential hazardous waste and is stored under the 90-day accumulation rule, additional reports required by state law will be prepared.

21.1.2 Spill Prevention

The purpose of this section is to provide planning instructions for response to spills of IDW or other hazardous materials stored for disposal at the OU-3 waste storage site location. IDW will be stored in a designated area beneath the Moffett Road underpass. The field team leader, and any other designated individuals must identify situations having potential for hazardous material releases. An IDW storage area inspection log will be used and maintained as part of the storage area facility record. The IDW storage area inspection log identifies items that will be checked at each IDW storage area. Inspections of the IDW storage area and emergency response supplies are to be performed by the SSHR during field operation phases.

21.1.3 Spill Containment

Each IDW spill, leak, or incident will be assessed by field personnel or other qualified individuals promptly upon discovery. This assessment will be conducted to characterize the degree of hazard to personnel and the environment and to implement effective control procedures. The responsible individual should attempt to determine the following information:

- type of materials released, container types, and storage location

- amount of materials released or at risk of being released
- location and direction of flow of the release
- hazardous characteristics of the released material
- occurrences due to spill (e.g., fire, injury, illnesses, damage to environment)

The assessment will include possible environmental and human-health hazards from the release including inhalation exposure, water runoff, and chemical agents used to control the emergency.

Table 21-1 lists suggested site-specific spill control equipment, location, and capabilities to be maintained at the IDW storage area.

Table 21-1
Suggested Containment Equipment

Item	Capability	Location
Absorbent 10-pound bag (minimum) or sufficient material to contain a 55-gallon drum spill (sorbent packs/pillows) compatible with the stored wastes	Absorb contents of a single drum of liquid or leakage from larger containers of solid or semisolids	Emergency supply bin within storage area
Shovel, polyethylene (nonsparking material) long-handled	Collect spilled material	Emergency supply bin within storage area
Scoop, short-handled	Collect spilled material	Emergency supply bin within storage area
Two extra drums, or overpacks for material storage and disposal	Overpack for damaged drum or container to collect used absorbent material	Emergency supply bin within storage area
Pump, noncorrosive hand-operated for liquid transfer with appurtenances	Transfer liquid from damaged drum at 2 gallons/minute	Emergency supply bin within storage area
Duct tape	Seal or join plastic sheet, temporary patch of drums	Emergency supply bin within storage area
Emergency barrier warning tape or traffic cones	Control access to site, warn unauthorized personnel	Emergency supply bin within storage area
Heavy-duty plastic bags	Collect contaminated trash, personal protective equipment	Emergency supply bin within storage area
Labels for drums	Label all generated waste	Emergency supply bin within storage area
Sheet plastic, 6-mil polyethylene or herculite (400 square feet)	Cover ground, cover waste piles	Emergency supply bin within storage area
Warning signs	Warn unauthorized personnel	Posted
Spill kit inventory list	Assure kit content complete	Emergency supply bin within storage area
Fire extinguisher	Size 3A:40BC	Emergency supply bin within storage area

21.1.4 Personal Protective Equipment

An HWP for the waste storage area will be prepared to indicate the appropriate PPE for an emergency response. This HWP will be updated based on the hazard potential for any particular waste stored. An emergency response team (ERT) will use the PPE ensemble specified by the HWP until the release has been characterized or until relieved by other ERT members. PPE for spill containment operations, which will be maintained ready for use, include two sets of the following:

- hard hat
- safety goggles
- rubber boots (at least knee length) with toe protection
- chemical resistant inner and outer gloves
- SARANEX-coated Tyvek coveralls with hood
- full- or half-face APRs with OV/acid gas/HEPA cartridges

21.1.5 Monitoring

While the ERT is cleaning the spill, the SSHR will monitor for chemical exposures. During the cleanup, direct-reading instrumentation will be employed including a PID and/or a FID and colorimetric indicator tubes if indicated. Personnel monitoring using sampling pumps and collection media, such as activated charcoal tubes, may also be employed, depending on the SSHR's assessment.

21.1.6 Record Keeping

The SSHR will document the spill in an Incident Report. The Incident Report will be forwarded to the designated authority (i.e., the ERO). Records of all hazardous material releases will be maintained with the project files. Information will include:

- time and date of incident,
- location of incident,
- size of release,
- chemicals involved,
- names of SSHR and ERT,
- cleanup procedures,
- unusual or pertinent incidents during the cleanup,
- disposition of cleanup waste,
- follow-up actions, and
- government agencies contacted.

In addition to the above information, the final release report will be maintained in the project files. The location of the project files will be determined before implementing the OMP, and will be reestablished, as necessary, prior to the property being transferred to any subsequent transferees.

21.1.7 Waste Management

All cleanup material resulting from an incident will be managed as the initial waste material

21.2 EMERGENCY RESPONSE CALLOUT

A basic emergency response plan is incorporated in Section 16 of this SSHP. This plan will be activated in the event of unplanned spills or releases of hazardous or unknown substances. This plan provides for designation of an ERO.

21.2.1 Response Implementation

In the event of an unplanned spill or release of unknown or hazardous substances, the ERO notifies activity-designated personnel who may implement the activity spill control plan. The activity-designated personnel will request outside or off-site assistance if required. Once at the site, the ERO will designate the spill as a restricted area and only authorized personnel, such as the ERT, will be permitted within the spill confines. ERT members and base personnel will be trained to contain and clean up spills from typical materials and quantities used on the project location. The SSHR will set up physical barriers warning unauthorized personnel to stay clear of the site and provide technical guidance to the ERT as needed.

Once barriers have been established, the ERO and SSHR will assess the spill conditions, as described in the above-mentioned assessment section, and determine whether the spill is small or large. This determination is based on the following criteria.

- Small spills involve a maximum volume of 55 gallons of a liquid or 100 pounds of a solid.
- Large spills involve liquids greater than 55 gallons or solids greater than 100 pounds.

Small spills may be remediated using absorbent materials. This task will be conducted by on-site workers, supervised by the SSHR and ERO. The SSHR will direct spill response operations and stay at the spill area until the area has been cleaned, surveyed, and prepared for release.

Action plans for large spills or small spills of highly toxic material should be developed quickly due to the potential for catastrophic events and off-site environmental contamination to the groundwater or neighboring facilities.

In the event of large spills, proper safety and health procedures will be established and communicated to the ERT prior to any control activity. The ERO will transfer response to the Hazardous Materials (HAZMAT) Team.

Until the HAZMAT Team can respond, ERT responsibilities consist of containing the spill to prevent contamination from spreading to outside areas and keeping unauthorized personnel from entering the restricted area. The base HAZMAT Team is responsible for actual spill containment and materials release termination in accordance with the activity spill containment and ERPs.

The ERO and ERT will provide assistance to the HAZMAT Team upon request and will stay at the spill area until released or until the area has been cleaned, surveyed, and authorized for reentry.

The SHM will approve the reentry to the site for routine use and will issue a final release report pertaining to cleanup of the area.

21.2.2 Notification

If, in the ERO assessment, off-site impacts are possible, the ERO will immediately notify the designated individual or their successors. If spillage to Peters Canyon Channel occurs, the U.S. Coast Guard must be notified. The Emergency Coordinator will provide a report for immediate transmission to the State Office of Emergency Services (or other state-designated agency) containing:

- name and telephone number of reporter,
- name and address of facility,
- time and type of incident,
- name and quantity of materials involved,
- extent of injuries, and
- possible off-site hazards to human health and/or the environment.

The types and quantities of hazardous material spills/releases that could be anticipated at this site are within the capabilities of control by on-site personnel. However, should an incident involve a situation that represents potential life-threatening situations or damage to the environment, the ERO will contact the designated activity environmental contacts for emergency response support. It may be necessary to contact federal, state, or local agencies for compliance with environmental and safety and health regulations. Agency notification is the responsibility of the ERO.

Section 22
REFERENCES

ACGIH. *See* American Conference of Governmental Industrial Hygienists.

American Conference of Governmental Industrial Hygienists. 1996. Threshold Limit Values.

Bechtel National, Inc. 1996. Draft Final Background Soils Issue Paper. Prepared for Southwest Division Naval Facilities Engineering Command.

———. 1997. Navy CLEAN Program Safety and Health Plan, Revision 2.

———. 2002. Draft Final Remedial Implementation Plan, Operable Unit-3, Marine Corps Air Station Tustin, Orange County, California. July.

———. 2003. Navy CLEAN Program Procedures Manual. Latest revision.

BNI. *See* Bechtel National, Inc.

National Institute for Occupational Safety and Health. No date. Short-Term Exposure Limits, Immediate Danger to Life and Health, Harmful Effects, Symptoms, Method of Analysis and Routes of Exposure. Pocket Guide to Chemical Hazards.

NIOSH. *See* National Institute for Occupational Safety and Health.

Southwest Division Naval Facilities Engineering Command. 2001. Final Record of Decision/Remedial Action Plan, Operable Unit-3, Moffett Trenches and Crash Crew Burn Pits Site, Marine Corps Air Station Tustin, California. December.

SWDIV. *See* Southwest Division Naval Facilities Engineering Command.

United States Army Corps of Engineers. 1996. Safety and Health Requirements Manual (EM 385-1-1). September.

USACE. *See* United States Army Corps of Engineers.

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ATTACHMENT F

LAND-USE CONTROL IMPLEMENTATION AND CERTIFICATION PLAN

FINAL
LAND-USE CONTROL IMPLEMENTATION AND CERTIFICATION PLAN
OPERABLE UNIT 3
MOFFETT TRENCHES AND CRASH CREW BURN PITS SITE

MARINE CORPS AIR STATION TUSTIN
ORANGE COUNTY, CALIFORNIA

May 2003

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FIGURE

TABLES

ACRONYMS/ABBREVIATIONS

BEI	Bechtel Environmental, Inc.
Cal. Civ. Code	*California Civil Code*
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemical of concern
DoD	Department of Defense
DON	Department of the Navy
DTSC	(California Environmental Protection Agency) Department of Toxic Substances Control
FOST	finding of suitability to transfer
HDPE	high-density polyethylene
IRP	Installation Restoration Program
LRA	Local Redevelopment Authority
LUCICP	land-use control implementation and certification plan
MCAS	Marine Corps Air Station
OCFCD	Orange County Flood Control District
OMP	operation and maintenance plan
OU	operable unit
RAP	remedial action plan
ROD	record of decision
RWQCB	(California) Regional Water Quality Control Board (Santa Ana Region)
§	section
SWDIV	Southwest Division Naval Facilities Engineering Command

Section 1
INTRODUCTION AND BACKGROUND

This Land-Use Control Implementation and Certification Plan (LUCICP) for the Moffett Trenches and Crash Crew Burn Pits site, Operable Unit (OU)-3, at Marine Corps Air Station (MCAS) Tustin addresses the institutional controls and land-use restrictions imposed by Section 7.2.5 of the OU-3 Record of Decision/Remedial Action Plan (ROD) (SWDIV 2001) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended (42 *United States Code* Section [§] 9601 et seq.) and by the *California Health and Safety Code* (Chapters 6.5 and 6.8 of Division 20). Land-use restrictions will be placed on the property through the Environmental Restriction Covenant and Agreement (the "Covenant") and the Quitclaim Deed (the "Deed") at the time of land transfer, as discussed further in Section 4.

Institutional controls are nonengineered mechanisms that limit exposure of future landowner(s) and/or user(s) to chemicals of concern (COCs) and/or maintain the integrity of the remedial action. Institutional controls can be a variety of legal devices imposed to assure that engineering controls stay in place and, where there are no engineering controls, to assure that restrictions on land use stay in place (DON 1999a). The implementation of institutional controls is addressed in this LUCICP. The implementation of engineering controls is addressed separately in the Final Operation and Maintenance Plan (OMP) for OU-3 (BEI 2003). This LUCICP will be included in the final version of the OMP as Attachment F.

The purpose of this LUCICP is to set forth a program of inspection and monitoring to assure that the land-use restrictions set forth in Section 7.2.5 of the OU-3 ROD are implemented, monitored, and enforced. The following requirements are addressed in this LUCICP as required by Section 7.2.5.5 of the ROD (SWDIV 2001):

- the required frequency for periodic inspection, sampling and analysis, routine maintenance, and reporting, which shall be not less than once every 5 years
- identification of the entities responsible for carrying out the monitoring, inspection, maintenance, and reporting related to the land-use restrictions
- identification of the entities responsible for enforcement of the land-use restrictions, which shall be the Department of the Navy (DON), California Environmental Protection Agency Department of Toxic Substances Control (DTSC), and California Regional Water Quality Control Board (RWQCB) Santa Ana Region; nothing, however, shall be construed to limit or abridge any authority that any regulatory agency may have under applicable law
- methods for periodically certifying compliance with the land-use restrictions and procedures for notifying the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction in the event of a failure to comply with or a failure of the effectiveness of the land-use restrictions

Section 2
LOCATION AND DESCRIPTION OF OPERABLE UNIT 3

OU-3 consists of the Moffett Trenches and Crash Crew Burn Pits site, also known as Installation Restoration Program (IRP) Site 1, at MCAS Tustin. MCAS Tustin, located in Orange County, California, is approximately 40 miles south of downtown Los Angeles and more than 100 miles north of the California/Mexico border. The site is situated along the western bank of Peters Canyon Channel, extending approximately 700 feet northeast of Moffett Drive to Edinger Avenue. During the time that MCAS Tustin was in operation, OU-3 was located in the northeastern corner of the base. The area requiring institutional controls and the locations of the existing structures at the site are shown on Figure 2-1. Currently, no legal description sufficient for recordation of the property is available. Such a description will be prepared in a manner consistent with Figure 2-1 and, at the time of property transfer, will be included in the Deed and the Covenant between the DON, DTSC, and RWQCB.

The area of applicability of land-use restrictions for the property containing the containment remedy is bounded to the northeast by the southern edge of Edinger Avenue, to the northwest by the western edge of the access road on the northwest edge of the Jamboree Road roadbed fill (approximately 20 feet west of the landfill gas probes), to the southwest by the toe of the northern concrete support structure for the Jamboree Road overpass above Moffett Drive, and to the southeast by the western edge of the Peters Canyon Channel bottom where it meets the containment remedy wall or western channel bank. Jamboree Road and associated road improvements traverse OU-3 from the south and north, covering most of the site.

The areas of applicability located outside the OU-3 site boundary for the land-use restrictions protecting the existing adjacent monitoring wells and equipment are the locations of monitoring wells I001BC47S, I001MW47D, I001MW43D, and I001BC43S (Figure 2-1). These areas and the four wells have been surveyed by a licensed land surveyor and have been included in the Covenant and Deed, which were signed in May 2002. The monitoring wells and equipment located within the OU-3 site boundary will also be surveyed by a licensed land surveyor and will be included in the Covenant and Deed at the time of transfer.

The areal extent of the landfill trenches and burn pits has been estimated to be approximately 600 by 250 feet based on aerial photographs and historical information. Other subsurface features presently at the site include a "fishbone-style" French drain system connected to 2 sumps, 11 monitoring wells, and 3 landfill gas probes (SWDIV 2001). The existing monitoring well network includes monitoring wells located both on and off the site. Additional monitoring wells and equipment associated with the remedy may be required and installed in the future. The ROD requires access to all OU-3 monitoring wells and equipment associated with the remedy (SWDIV 2001).

In the area of the Jamboree Road improvements, a high-density polyethylene (HDPE) liner was installed on top of the original ground surface. A maximum of approximately 20 feet of fill material was placed on the site to support the elevating and widening of Jamboree Road and construction of the elevated ramps. As a result, virtually the entire former waste disposal trenches, pits, and landfill areas are now covered by Jamboree Road, the ramps, and associated embankment slopes as indicated on Figure 2-1. The road improvements also include a surface-water runoff collection system that collects and directs surface water to Peters Canyon Channel.

Information on the road improvements and HDPE liner is provided in Attachment B of the ROD (SWDIV 2001).

A dirt access road, approximately 15 feet wide, runs parallel and adjacent to the western bank of Peters Canyon Channel. This road is separated from the remainder of the site by a chain-link fence. The part of the site that has not been covered by the Jamboree Road improvements is a narrow strip between the east Jamboree Road embankment and the fence line. A steel-reinforced concrete containment wall, approximately 805 feet long, lines the western bank of Peters Canyon Channel adjacent to the site (SWDIV 2001).

The DON has recognized the city of Tustin as the Local Redevelopment Authority (LRA) for preparation of the MCAS Tustin Specific Plan/Reuse Plan Errata (City of Tustin 1998). The proposed LRA Reuse Plan alternative for MCAS Tustin consists of a combination of residential, commercial, and public uses. The proposed reuse for OU-3 (Parcels 40 and 41) is for circulation and drainage facilities. The parcel designations are consistent with the 1998 Specific Plan/Reuse Plan designations. The final Environmental Impact Statement/Environmental Impact Report provides detailed evaluations of several proposed civilian reuse alternatives for MCAS Tustin (DON 1999b).

Section 3
LAND-USE RESTRICTIONS

Land-use restrictions are the institutional controls required to limit exposure to future landowner(s) and/or user(s) and/or to maintain the integrity of the remedial action. These institutional controls are designed to limit exposure to COCs and to protect the selected remedy. Land-use restrictions will be placed on the property deed at the time of land transfer. Monitoring and inspections will be conducted to assure that the land-use restrictions are being followed. As stated in Section 7.2.5.1 of the ROD, land-use control objectives for protecting the remedy through the land-use restrictions include:

- maintaining the integrity of the final cover by preventing unauthorized excavations at the site,
- preventing land use that presents unacceptable risk to human health or the environment due to residual contamination,
- preventing land use that accelerates the movement of contaminated groundwater and/or landfill gas, and
- protecting the groundwater and landfill gas monitoring equipment.

Institutional controls will also be used to assure access to the site by the DON and regulatory agencies to assure monitoring and maintenance of the final remedy are properly conducted. As stated in Section 7.2.5.3 of the ROD (SWDIV 2001), land-use restrictions will be applied to the property and included in the Finding of Suitability to Transfer (FOST), the Covenant, and the Deed.

Land-Use Restrictions Within the Property Containing the Containment Remedy

1. The area containing the containment remedy shall not be used for a residence, hospital for humans, a school for persons under 21 years of age, a day care center for children, or any permanently occupied human habitation other than those used for industrial purposes.
2. There shall be no construction of facilities, structures, or appurtenances or any other land-disturbing activity on the surface of the area containing the containment remedy unless prior review and written approval are obtained from the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity except as provided in paragraph 3 below. There shall be no excavations within the area containing the containment remedy prior to taking any necessary measures to locate the depth of the geotextile liner to verify that excavation will not damage the geotextile liner.
3. No prior review and written approval of the DON, DTSC, RWQCB, or other regulatory agencies that have jurisdiction over the proposed activity are required for shallow excavation to a depth not greater than 5 feet below the ground surface or to the geotextile liner, whichever is closer to the ground surface, so long as the verification of the geotextile liner location required under paragraph 2 above has been conducted. If the geotextile liner or waste is encountered in the course of any excavation, the excavation shall be stopped immediately and the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the activity shall be notified by the party responsible for the excavation.

4. There shall be no irrigation, landscaping, or planting activities within the area of the containment remedy prior to submittal and review of an irrigation and landscaping plan and prior to review and written approval by the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity in order to assure that such activities do not jeopardize the integrity and performance of the containment remedy.

5. No groundwater shall be extracted and no new groundwater wells shall be installed within the area of the containment remedy without prior review and written approval from the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity.

6. The French drain system, sumps, monitoring wells, survey monuments, signs describing use restrictions, fencing, or monitoring equipment within the area of the containment remedy shall not be removed or damaged without prior review and written approval of the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity.

7. Easements: Currently, the DON has granted two easements in and adjacent to the area containing the containment remedy. The Orange County Flood Control District (OCFCD) has a perpetual easement for the construction, installation, maintenance, operation, and repair of Peters Canyon Channel (OCFCD 1963). In general, this easement allows improvements (including widening, deepening, and concreting) to the channel by the OCFCD at no cost to the DON, provided that the improvements are in accordance with plans approved by the DON and that the OCFCD replaces, to the DON's satisfaction, any of the DON improvements to the property that may be damaged. The Irvine Company (subsequently assigned to the city of Tustin) has a perpetual easement for the construction, operation, maintenance, repair, and replacement of Jamboree Road (The Irvine Company 1988), in accordance with plans approved by the DON. The DON will reserve unto itself these approval authorities in the Deed to apply to the activities allowed in these easements in and adjacent to the area containing the containment remedy.

Land-Use Restrictions for Adjacent Wells

Monitoring wells I001BC47S, I001MW47D, I001MW43D, and I001BC43S (Figure 2-1) and associated monitoring equipment, as well as any additional adjacent monitoring wells and equipment required during the post-ROD phase before or after the conveyance, shall not be altered, disturbed, or removed without the prior review and written approval of the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the activity.

Additional Specific Requirements

The DON will also include the following specific requirements in the FOST, the Covenant, and the Deed.

- The transferee and future transferees must comply with all terms and conditions relating to land-use restrictions set forth in the OU-3 ROD.
- The transferee and future transferees must notify subsequent future transferees of all land-use restrictions and access provisions set forth herein.

- The transferee must notify the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the property containing the containment remedy, adjacent wells, or additional monitoring wells and equipment required during the post-ROD phase before or after the conveyance of the property of any transfer of all or a portion of that property by the transferee not later than 30 days after the conveyance.

Section 4
LEGAL MECHANISMS FOR IMPLEMENTATION AND ENFORCEMENT OF LAND-USE RESTRICTIONS

The land-use restrictions set forth in the ROD and this LUCICP will be incorporated into and implemented through two separate legal instruments as provided in the OU-3 ROD: 1) the Covenant between the DON, DTSC, and RWQCB and 2) the Deed between the transferee and the DON. The Covenant will incorporate the land-use restrictions into restrictive covenants that run with the land and are enforceable by DTSC and RWQCB against future transferees. The Deed will include the identical land-use restrictions in environmental restrictive covenants that run with the land and will be enforceable by the DON against future transferees. In essence, the DON, DTSC, and RWQCB will each have the legal authority to enforce the land-use restrictions and will share responsibility for their enforcement.

4.1 ENVIRONMENTAL RESTRICTION COVENANT AND AGREEMENT (CHAPTERS 6.5 AND 6.8 OF DIVISION 20 OF THE *CALIFORNIA HEALTH AND SAFETY CODE* AND *CALIFORNIA CIVIL CODE* SECTION 1471)

As stated in Section 7.2.5.6 of the ROD, the DON, DTSC, and RWQCB shall enter into good-faith negotiations to enter into a Covenant pursuant to the substantive requirements of *California Health and Safety Code* Division 20, Chapters 6.5 and 6.8, and *California Civil Code* (Cal. Civ. Code) § 1471 regarding environmental land-use restrictions, restrictive covenants, and access provisions. Such Covenant shall be subject to review and comment by and shall be developed in consultation with the LRA. This Covenant will be consistent with and serve as a mechanism to implement the restrictions set forth in Section 7.2.5 of the ROD in accordance with DON policy. Once the Covenant is finalized, it will be executed contemporaneously with the negotiation and execution of the conveyance of the property to the transferee(s) by deed pursuant to the Defense Base Closure and Realignment Act of 1990, 10 *United States Code* § 2687.

The Covenant will be executed by the DON on behalf of the United States, and will serve as a legally binding agreement between the United States and its successor and assigns (the covenantor) and the DTSC and RWQCB and their successors and assigns, who shall be identified in the Covenant as the covenantees, pursuant to Cal. Civ. Code § 1471. The Covenant will provide for access as set forth in Section 7.2.5.4 of the ROD. The Covenant will include the legal description of the property containing the containment remedy and adjacent monitoring wells and equipment as shown on Figure 2-1 and additional monitoring wells and equipment required during the post-ROD phase before conveyance of the property. The Covenant will be binding upon all future owners until legally terminated; that is, it will run with the land. The Covenant will include information summarizing the remedial actions at OU-3 and provisions for terminating or modifying the Covenant in the event it is no longer necessary to protect human health and the environment. The Covenant will be recorded by DTSC in the office of the county recorder for the county of Orange.

4.2 ENVIRONMENTAL RESTRICTIVE COVENANTS IN THE DEED (*CALIFORNIA CIVIL CODE* SECTION 1471)

As stated in Section 7.2.5.7 of the ROD, pursuant to Cal. Civ. Code § 1471, the DON shall include in the Deed between the United States and the transferee(s) the same land-use restrictions and equivalent access provisions that are set forth in Section 7.2.5 of the ROD and the Covenant. All such provisions shall use the language contained herein.

The Deed will include the legal description of the property containing the containment remedy and adjacent wells as shown in Figure 2-1 as well as additional monitoring wells and equipment required during the post-ROD phase before conveyance of the property. The land-use restrictions and access provisions in the Deed will be binding upon all future owners until legally terminated; that is, they will run with the land. The Deed will include information summarizing the remedial actions at OU-3 and provisions for terminating or modifying the restrictive covenants in the Deed in the event they are no longer necessary to protect human health and the environment.

The Deed will be recorded in the office of the county recorder for the county of Orange. A copy of the recorded deed will be provided to DTSC following recordation.

Section 5
LAND-USE RESTRICTION MONITORING, REPORTING, AND SELF-CERTIFICATION

Land-use restriction monitoring, reporting, and self-certification will be implemented after the property is transferred. The DON's involvement in monitoring and inspecting the engineering controls is discussed in the OMP for OU-3 (BEI 2003). After the property is transferred, the DON shall monitor and inspect the status of compliance with the institutional controls using the Institutional Controls Field Inspection Log (for DON use) (Table 5-1).

Upon property transfer, self-certification and verification of land-use restriction monitoring and reporting shall be performed by the transferee(s) using the Institutional Controls Annual Field Inspection Log (for Transferee use) (Table 5-2) to assure that the institutional controls are in compliance and to document instances of noncompliance in order to support any enforcement action that may be necessary (DoD 2001). The DON, DTSC, and RWQCB shall include conditions in the Covenant and the Deed requiring that the transferee(s) annually certify compliance with the land-use restrictions set forth in Section 3 of this LUCICP and included in those legal instruments.

The transferee(s) will be required to submit a signed Institutional Controls Annual Field Inspection Log (for Transferee use) (Table 5-2) to the DON, DTSC, and RWQCB. Copies of a completed and signed Table 5-2 shall be delivered by the transferee(s) to the DON, DTSC, and RWQCB by *Certified Mail, Return Receipt Requested* in January of each calendar year following the date of transfer of the respective property subject to the land-use restrictions. The field inspection log for the first year shall address uses and activities initiated between the date of transfer and the first January reporting deadline. Field inspection logs for subsequent years shall address new activities and uses that were initiated during the reporting period for the particular year.

The mailing address for DTSC is as follows:

> Department of Toxic Substances Control
> Southern California Region
> 5796 Corporate Avenue
> Cypress, California 90630
>
> Attention: Chief, Southern California Operations
> Office of Military Facilities

The DON shall evaluate the implementation and performance of the land-use restrictions during the 5-year review of the OU-3 remedial action to assure that human health and the environment are being protected by the remedial action as required by Section 121(c) of CERCLA. As a matter of partnering, 5-year reviews relating to the OU-3 ROD will be submitted to the appropriate regulators for their review and comment.

Table 5-1
Institutional Controls Field Inspection Log (for DON use)

Land-Use Restriction Checklist: Provide descriptions and comments on separate pieces of paper and attach.
Inspected by: Date: ___________ ____ (name, affiliation, address, and telephone number)
1. Structures in the area containing the containment remedy: Is the area containing the containment remedy being used as a residence, hospital for humans, a school for persons under 21 years of age, a day care center for children, or any permanently occupied human habitation other than those used for industrial purposes? YES / NO (circle one). If yes, describe Has there been any construction of facilities or structures, or appurtenances on the surface of the area containing the containment remedy since the last inspection? YES / NO (circle one). If yes, was prior written approval obtained from the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity? YES / NO (circle one) Describe. If yes, was construction conducted in accordance with the approved plan?
2. Land-disturbing activities and potential for damaging the geotextile liner (excavations greater than 5 feet below ground surface): Is there evidence of land-disturbing activity on the surface of the area containing the containment remedy? YES / NO (circle one). If yes, what was the depth of the excavation? _____ feet. If the excavation was greater than 5 feet below ground surface: (a) Was prior review and written approval obtained from the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity? YES / NO (circle one). (b) Was the excavation undertaken in accordance with any and all applicable conditions of approval? YES / NO (circle one). (c) Were necessary measures taken to locate the depth of the geotextile liner prior to the excavation to prevent damage to the geotextile liner? YES / NO (circle one). (d) Was the geotextile liner or waste encountered in the course of any excavation? YES / NO (circle one). If yes, when did it occur (date, time)? ____________. At what depth below land surface was it encountered? ________. Was the excavation stopped immediately? YES / NO (circle one). Were the DON, DTSC, and RWQCB notified by the party responsible for the excavation? YES / NO (circle one). If yes, describe how and when the notifications occurred.
3. Land-disturbing activities and potential for damaging the geotextile liner (shallow excavations to a depth not greater than 5 feet below the ground surface, or to the geotextile liner, whichever is closer to the ground surface): If the excavation was to a depth not greater than 5 feet below the ground surface: (a) Were necessary measures taken to locate the depth of the geotextile liner prior to the excavation to prevent damage to the geotextile liner? YES / NO (circle one) (b) Was the geotextile liner or waste encountered in the course of any excavation? YES / NO (circle one). If yes, when did it occur (date, time)? ____________. At what depth below ground surface was it encountered? ________. Was the excavation stopped immediately? YES / NO (circle one) Were the DON, DTSC, and RWQCB notified by the party responsible for the excavation? YES / NO (circle one). If yes, describe how and when the notifications occurred.

(table continues)

Table 5-1 (continued)

4.	Irrigation and landscaping activities: Is there evidence of irrigation, landscaping, or planting activities within the area of the containment remedy? YES / NO (circle one). If yes, was an irrigation and landscaping plan submitted, reviewed, and approved in writing by the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity prior to conducting this activity? YES / NO (circle one). Describe. If yes, were the irrigation, landscaping, and planting activities conducted in accordance with the approved plan?
5	Groundwater extraction: Has any groundwater been extracted within the area of the containment remedy? YES / NO (circle one). Are there any new groundwater wells installed within the area of the containment remedy since the last inspection? YES / NO (circle one) If yes, was prior review and written approval obtained from the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity? YES / NO (circle one). Describe. If yes, were the wells installed in accordance with any applicable conditions of approval?
6.	Monitoring equipment: Have any of the following items located within the area of the containment remedy been removed or damaged: French drain system, sumps, monitoring wells and associated monitoring equipment, survey monuments, landfill gas probes, signs describing use restrictions, fencing, or other related equipment? YES / NO (circle one). If they were removed or damaged, was prior review and written approval obtained from the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity? YES / NO (circle one). Describe. If yes, were they removed or managed in accordance with any applicable conditions of approval?
7.	Adjacent monitoring equipment: Have any of the following items located adjacent to the area of the containment remedy been removed or damaged: monitoring wells and associated monitoring equipment, survey monuments, signs describing use restrictions, fencing, or other related equipment? YES / NO (circle one). If they were removed or damaged, was prior review and written approval obtained from the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity? YES / NO (circle one). Describe. If yes, were they removed or managed in accordance with any applicable conditions of approval?

Acronyms/Abbreviations:
DON – Department of the Navy
DTSC – (California Environmental Protection Agency) Department of Toxic Substances Control
RWQCB – (California) Regional Water Quality Control Board

Table 5-2
Institutional Controls Annual Field Inspection Log (for Transferee use)

Land-Use Restriction Checklist: Provide descriptions and comments on separate pieces of paper and attach.

Inspected by: Date: ____________

(name, affiliation, address, and telephone number)

1. Structures in the area containing the containment remedy:

   Is the area containing the containment remedy being used as a residence, hospital for humans, a school for persons under 21 years of age, a day care center for children, or any permanently occupied human habitation other than those used for industrial purposes? YES / NO (circle one). If yes, describe.

   Has there been any construction of facilities or structures, or appurtenances on the surface of the area containing the containment remedy since the last inspection? YES / NO (circle one).

   If yes, was prior written approval obtained from the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity? YES / NO (circle one). Describe.

   If yes, was construction conducted in accordance with the approved plan?

2. Land-disturbing activities and potential for damaging the geotextile liner (excavations greater than 5 feet below ground surface):

   Is there evidence of land-disturbing activity on the surface of the area containing the containment remedy? YES / NO (circle one). If yes, what was the depth of the excavation? _____ feet.

   If the excavation was greater than 5 feet below ground surface:

   (a) Was prior review and written approval obtained from the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity? YES / NO (circle one).

   (b) Was the excavation undertaken in accordance with any and all applicable conditions of approval? YES / NO (circle one).

   (c) Were necessary measures taken to locate the depth of the geotextile liner prior to the excavation to prevent damage to the geotextile liner? YES / NO (circle one).

   (d) Was the geotextile liner or waste encountered in the course of any excavation? YES / NO (circle one). If yes, when did it occur (date, time)? ____________. At what depth below land surface was it encountered? ________. Was the excavation stopped immediately? YES / NO (circle one). Were the DON, DTSC, and RWQCB notified by the party responsible for the excavation? YES / NO (circle one). If yes, describe how and when the notifications occurred.

3. Land-disturbing activities and potential for damaging the geotextile liner (shallow excavations to a depth not greater than 5 feet below the ground surface, or to the geotextile liner, whichever is closer to the ground surface):

   If the excavation was to a depth not greater than 5 feet below the ground surface:

   (a) Were necessary measures taken to locate the depth of the geotextile liner prior to the excavation to prevent damage to the geotextile liner? YES / NO (circle one).

   (b) Was the geotextile liner or waste encountered in the course of any excavation? YES / NO (circle one). If yes, when did it occur (date, time)? ____________. At what depth below ground surface was it encountered? ________. Was the excavation stopped immediately? YES / NO (circle one). Were the DON, DTSC, and RWQCB notified by the party responsible for the excavation? YES / NO (circle one). If yes, describe how and when the notifications occurred.

(table continues)

Table 5-2 (continued)

4. Irrigation and landscaping activities:

   Is there evidence of irrigation, landscaping, or planting activities within the area of the containment remedy? YES / NO (circle one).

   If yes, was an irrigation and landscaping plan submitted, reviewed, and approved in writing by the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity prior to conducting this activity? YES / NO (circle one). Describe.

   If yes, were the irrigation, landscaping, and planting activities conducted in accordance with the approved plan?

5. Groundwater extraction:

   Has any groundwater been extracted within the area of the containment remedy? YES / NO (circle one).

   Are there any new groundwater wells installed within the area of the containment remedy since the last inspection? YES / NO (circle one).

   If yes, was prior review and written approval obtained from the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity? YES / NO (circle one). Describe.

   If yes, were the wells installed in accordance with any applicable conditions of approval?

6. Monitoring equipment:

   Have any of the following items located within the area of the containment remedy been removed or damaged: French drain system, sumps, monitoring wells and associated monitoring equipment, survey monuments, landfill gas probes, signs describing use restrictions, fencing, or other related equipment? YES / NO (circle one).

   If they were removed or damaged, was prior review and written approval obtained from the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity? YES / NO (circle one). Describe.

   If yes, were they removed or managed in accordance with any applicable conditions of approval?

7. Adjacent monitoring equipment:

   Have any of the following items located adjacent to the area of the containment remedy been removed or damaged: monitoring wells and associated monitoring equipment, survey monuments, signs describing use restrictions, fencing, or other related equipment? YES / NO (circle one).

   If they were removed or damaged, was prior review and written approval obtained from the DON, DTSC, RWQCB, and other regulatory agencies that have jurisdiction over the proposed activity? YES / NO (circle one). Describe.

   If yes, were they removed or managed in accordance with any applicable conditions of approval?

I hereby certify that the information contained in this report is true and accurate based upon information and belief following a reasonable inquiry.

Name: ______________________________

Signature: ______________________________

Title: ______________________________

Date: ______________________________

Acronyms/Abbreviations:

DON – Department of the Navy
DTSC – (California Environmental Protection Agency) Department of Toxic Substances Control
RWQCB – (California) Regional Water Quality Control Board

Section 6
LAND-USE RESTRICTION ENFORCEMENT

If a violation of a land-use restriction is identified and/or documented by the DON, DTSC, or RWQCB or in a transferee's Annual Land-Use Restriction Compliance Certification Report, the entity identifying the violation will notify the others within ten (10) working days of identifying the violation. The DON, DTSC, and RWQCB shall then consult to determine what, if any, action(s) should be taken, which of them shall undertake the action(s), and when it shall be undertaken. The results of such a consultation shall be memorialized in letters of agreement.

Section 7
REFERENCES

Bechtel Environmental, Inc. 2003. Final Operation and Maintenance Plan, Operable Unit 3, Marine Corps Air Station Tustin, Orange County, California. Prepared for Southwest Division Naval Facilities Engineering Command. May.

BEI. *See* Bechtel Environmental, Inc.

City of Tustin. 1998. MCAS Tustin Specific Plan/Reuse Plan, Errata. September.

Department of Defense. 2001. Memorandum Regarding Policy on Land Use Controls Associated with Environmental Restoration Activities. 17 January.

Department of the Navy. 1999a. Memorandum Regarding Department of the Navy Environmental Policy Memorandum 99-02; Land Use Controls. 25 May.

———. 1999b. Final Environmental Impact Statement/Environmental Impact Report, Disposal and Reuse of MCAS Tustin, California. In conjunction with the city of Tustin. December.

DoD. *See* Department of the Defense.

DON. *See* Department of the Navy.

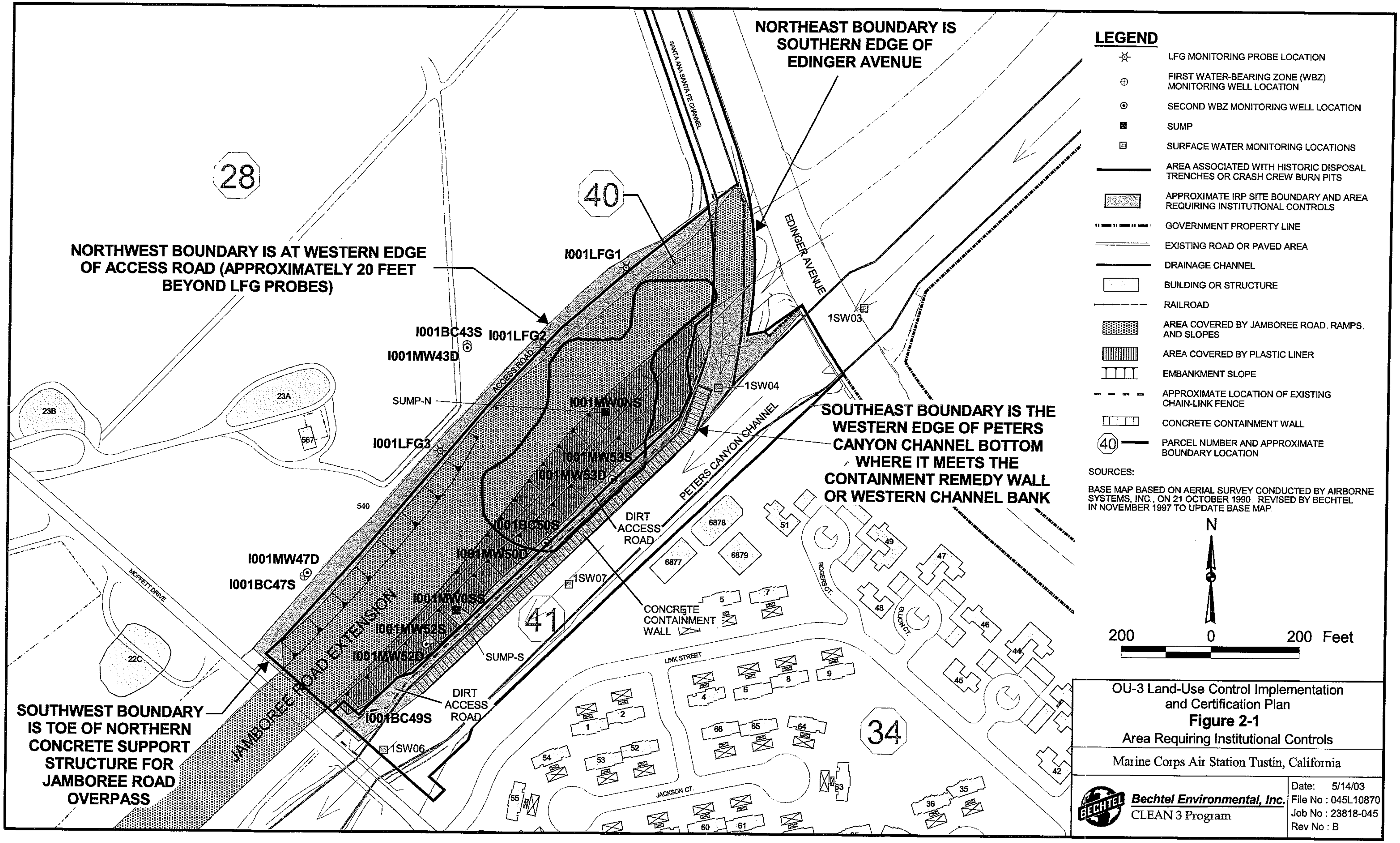
OCFCD. *See* Orange County Flood Control District.

Orange County Flood Control District. 1963. Grant of Easement between Department of the Navy and Orange County Flood Control District. 04 June.

Southwest Division Naval Facilities Engineering Command. 2001. Final Record of Decision/ Remedial Action Plan for Operable Unit-3, Moffett Trenches and Crash Crew Burn Pits Site, Marine Corps Air Station Tustin. December.

SWDIV. *See* Southwest Division Naval Facilities Engineering Command.

The Irvine Company. 1988. Grant of Easement Between Department of the Navy and The Irvine Company. 05 August.


NORTHEAST BOUNDARY IS SOUTHERN EDGE OF EDINGER AVENUE
NORTHWEST BOUNDARY IS AT WESTERN EDGE OF ACCESS ROAD (APPROXIMATELY 20 FEET BEYOND LFG PROBES)
SOUTHEAST BOUNDARY IS THE WESTERN EDGE OF PETERS CANYON CHANNEL BOTTOM WHERE IT MEETS THE CONTAINMENT REMEDY WALL OR WESTERN CHANNEL BANK
SOUTHWEST BOUNDARY IS TOE OF NORTHERN CONCRETE SUPPORT STRUCTURE FOR JAMBOREE ROAD OVERPASS
28
40
41
34
I001LFG1
I001LFG2
I001LFG3
I001BC43S
I001MW43D
SUMP-N
I001MW0NS
I001MW53S
I001MW53D
I001BC50S
I001MW50D
I001MW47D
I001BC47S
I001MW0SS
I001MW52S
I001MW52D
SUMP-S
I001BC49S
1SW03
1SW04
1SW06
1SW07
DIRT ACCESS ROAD
CONCRETE CONTAINMENT WALL
JAMBOREE ROAD EXTENSION
ACCESS ROAD
EDINGER AVENUE
PETERS CANYON CHANNEL
SANTA ANA SANTA FE CHANNEL
MOFFETT DRIVE
LINK STREET
JACKSON CT.
ROGERS CT.
23A
23B
22C
567
540
6877
6878
6879
LEGEND
LFG MONITORING PROBE LOCATION
FIRST WATER-BEARING ZONE (WBZ) MONITORING WELL LOCATION
SECOND WBZ MONITORING WELL LOCATION
SUMP
SURFACE WATER MONITORING LOCATIONS
AREA ASSOCIATED WITH HISTORIC DISPOSAL TRENCHES OR CRASH CREW BURN PITS
APPROXIMATE IRP SITE BOUNDARY AND AREA REQUIRING INSTITUTIONAL CONTROLS
GOVERNMENT PROPERTY LINE
EXISTING ROAD OR PAVED AREA
DRAINAGE CHANNEL
BUILDING OR STRUCTURE
RAILROAD
AREA COVERED BY JAMBOREE ROAD, RAMPS, AND SLOPES
AREA COVERED BY PLASTIC LINER
EMBANKMENT SLOPE
APPROXIMATE LOCATION OF EXISTING CHAIN-LINK FENCE
CONCRETE CONTAINMENT WALL
40 PARCEL NUMBER AND APPROXIMATE BOUNDARY LOCATION
SOURCES:
BASE MAP BASED ON AERIAL SURVEY CONDUCTED BY AIRBORNE SYSTEMS, INC., ON 21 OCTOBER 1990. REVISED BY BECHTEL IN NOVEMBER 1997 TO UPDATE BASE MAP.
N
200 0 200 Feet
OU-3 Land-Use Control Implementation and Certification Plan
Figure 2-1
Area Requiring Institutional Controls
Marine Corps Air Station Tustin, California
Bechtel Environmental, Inc.
CLEAN 3 Program
Date: 5/14/03
File No : 045L10870
Job No : 23818-045
Rev No : B